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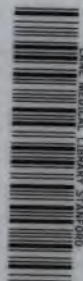
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PREFACE.

The modest aim of this volume is well expressed in the title-page. It is designed to aid the student in acquiring the principles primarily essential to a thorough knowledge of the subjects treated. Many omissions have necessarily been made, omissions which each must supply by reading and study after the hurry and rush of the medical school has given place to the quiet of beginning practice.

If the principles here laid down enable the overworked student to formulate his knowledge upon subjects usually treated as of minor importance in the surgical course, but in reality chiefly essential in the early years of his professional life, the author will feel well repaid for the time and labor bestowed upon the work.

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ESSENTIALS OF BANDAGING.

For what purposes are bandages applied?

The general indications for the application of bandages are, to retain splints and dressings, and to make pressure.

THE ROLLER BANDAGE.

Describe the roller bandage.

The roller bandage may be made of muslin, calico, gauze, or any thin, strong fabric. Usually unbleached muslin is used. A piece from three to twelve yards in length is procured, the selvedge is removed, and it is then torn into strips varying in width from half an

FIG. 1.



Double and Single-headed Roller.

inch to three inches. Each strip is freed of loose threads at its edges, and is rolled tightly in the form of a cylinder. The rolling may be from each end toward the middle, forming two cylinders; this is called the double-headed roller.

How is the bandage rolled?

This is usually done upon a small machine provided for the purpose. Where this is not at hand, a core should first be made by

folding one end of the bandage upon itself for about eight inches of its length. This doubling is again folded in, and the process is continued till a central mass is formed. This core is made still larger by placing it upon the thigh and including one or two feet of the length of the bandage by rolling it between the thigh and the palm of the hand. When the centre is sufficiently large, it is taken between the thumb and middle finger of the left hand while the continuation of the strip passes between the thumb and the index finger of the right hand. By seizing the body of the bandage in the right middle, ring and little fingers, with the hand in supination and

FIG. 2.



Rolling the Bandage.

carrying the latter to pronation, the cylinder is made to perform a half revolution, with the thumb and little finger of the left hand representing the supports of its axis. As the right hand is again carried to supination, a certain portion of the length of the bandage, passing between its thumb and index finger, is wound tightly upon the core; again grasping the latter and repeating these movements the roller bandage is gradually completed. It should be so tightly wound that it is impossible to push out the core by a firm pressure of the thumb upon one end of the cylinder, and should be so thoroughly cleared of loose threads that there is no possibility of these impeding the surgeon when the bandage is applied.

How should a bandage be pinned?

Small safety pins should be used, when obtainable. The terminal extremity of the bandage should be folded upon itself for one or two inches of its length, and one or two pins, depending upon the width of the bandage, should secure this reduplication to the turns beneath. Where ordinary pins are used, the points should be directed downward and should always be buried in the folds of the bandage; when applied to secure dressings of the extremities the points should be directed toward the fingers or toes.

Name the parts of a roller bandage.

The free end, left after the formation of the cylinder, is termed the initial extremity; the end enveloped in the core is termed the terminal extremity. Further, the bandage has an upper and a lower border, and an internal and external surface. The cylinder formed by the rolled bandage is termed the body of the roller.

How is a roller bandage applied?

The bandage is nearly always applied from left to right. The body of the roller is taken in the palm of the right hand in such a way that the thumb lies parallel with the long axis of the cylinder; the *external* surface of the initial extremity is applied to the surface to be covered in, and is held in place by pressure of the thumb of the left hand until it is caught by the bandage carried around the part. This first turn is further secured by adding an additional circular turn.

If the limb, or the part to be bandaged is cylindrical in shape, it may be covered in by the application of *spiral turns*, or those which pass upward, each one overlapping the other. Where, however, a conical part is to be covered, the *spiral reversed* turns are required. In surgical dressing all of the following turns may be required:—

1. *Circular turns*, or those which pass around a part, one directly overlying the other. Nearly all bandages are started by two circular turns.
2. *Oblique turns*, or those in which the bandage passes up the limb without overlapping, leaving a space between each turn. In applying loose dressings to bruises or extensive burns this bandage is of service.
3. *Spiral turns*, or those in which the entire surface involved is

covered by the bandage. These differ from the oblique turns only in the fact that each time the bandage is carried around the limb it overlaps the preceding turn. In bandaging poorly developed arms and legs, or in applying dressings to the chest or abdomen, these turns are used.

FIG. 3.



The Oblique Turn.

4. *Recurrent Turns*.—By means of these the end of a stump or the top of the head is covered in. The initial extremity of the roller being secured, the latter is carried directly across the apex of the projecting surface and well down upon the other side, where it is held in place by the finger of the bandager, or of an assistant. The bandage is now carried back to its point of starting, caught by the finger, and carried as before across the surface to be covered. Each of these turns *overlaps* the other for two-thirds of its width. When the surface to be protected is entirely covered by the bandage the latter is carried once or twice circularly about the part, thus securing the loops made by reversing the direction of the bandage in applying the recurrent turns.

5. *Spica and figure-of-eight turns* are those in which the bandage forms, by oblique turns—first passing upward and then returning upon themselves—two loops, which present the form of an eight. By overlapping the crossings of these loops a series of angles or spicas is formed. For instance, a bandage is carried obliquely upward across the knee, around the back of the thigh obliquely downward across the knee again, and around the back of the upper part of the calf, returning to the point of starting, thus forming a figure-of-eight. If these turns are repeated, each overlapping its predecessor, and passing upward or downward, a series of angles or spicas will be formed.

6. *The spiral reversed turns* are those in which the bandage is folded back upon itself, thus accommodating its surface to conical or irregularly-shaped parts.

Describe the spiral reversed bandage.

This turn, the most difficult of all to acquire, consists in folding the bandage over so that the surface previously in contact with the skin is turned outward with each reverse. This is accomplished,

after having fixed the bandage by one or two circular turns, by overlapping the latter as though an oblique were about to be formed. In place of this, however, the thumb of the left hand fixes the bandage, while the latter is folded over by carrying the hand containing the roller from the position of supination to one of pronation. The body of the roller is now passed beneath the limb from the right to the left hand; not till it is received in the left hand is traction exerted. This traction causes a perfectly smooth fold, and accurately adapts the bandage to a conical or irregular

FIG. 4.



The Spiral Reversed Turn.

surface. This process is repeated each time the bandage is carried around the limb, or as often as required to accomplish perfectly uniform pressure. An effort should be made to have the angles formed between the turned down border of one fold and the lower border of the next perfectly in line. It must be remembered that this line represents the portion of the bandage which exerts the greatest pressure, hence it should not be placed where such pressure would be undesirable, as, for instance, over the ulna or over the crest of the tibia.

What points must be especially observed in applying the roller bandage?

1. That it should not be too tight. As a means of gauging this point when limbs are bandaged, the fingers and toes are left exposed. If, after the application of the most elaborate bandage, the patient complains of pain, and there are marked signs of venous congestion, not relieved by elevation of the part, the bandage must be immediately removed and replaced more carefully.

2. That it should fit accurately and neatly to the part.

3. That if firm pressure is required, this should be *uniform*. In case pressure is required at any portion of the extremities, the roller bandage must include the whole of the limb lying beyond the point of pressure.

4. That reverses, recurrent turns, and points of crossing should be secured by pins.

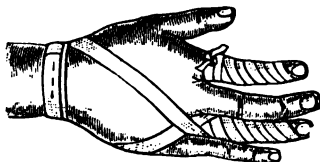
Roller Bandages of the Extremities.

Describe the spiral of one finger.

This bandage should be three-quarters of an inch wide, and one and a half yards long.

The roller is *fixed* by a repeated circular turn about the wrist; it is then carried down across the back of the hand to the finger, the extremity of which is reached by an oblique turn. The whole

FIG. 5.



Spiral of One Finger.

finger is then covered in to its palmar extremity, the bandage passing upward by means of spiral or reversed turns; on reaching the web of the finger, the roller is carried across the back of the hand to the point of starting, and the dressing is completed by a circular turn about the wrist.

Describe the spiral of four fingers (gauntlet).

The roller should be one inch in breadth and five yards long.

The turns are precisely the same as in the spiral of one finger. The first finger covered in is the index of the right hand, or the little finger of the left. As each finger is completely covered the roller is carried up across the dorsum of the hand, once around the wrist and down across the back of the hand to the next finger. The thumb also may be included, if necessary.



In cellulitis, burns, or poisoning involving a considerable portion of the surface of the hand, this dressing will be found useful.

Describe the spica of the thumb.

This roller should be three yards long and three-quarters of an inch wide. It may be *ascending* or *descending*.

The *ascending spica of the thumb* overlaps from the extremity of this digit toward the wrist. The bandage is fixed at the wrist by a repeated circular turn; is then carried obliquely across the metacarpus of the thumb to the distal extremity of the first phalanx, around

FIG. 6.



Gauntlet, also taking in the Thumb.

FIG. 7.



Spica of Thumb.

which a circular turn is made. From this point the roller is carried across the dorsum of the thumb to the wrist, half around the wrist, obliquely upward to the position of the circular turn around the phalanx, half around this and obliquely downward to the wrist. These turns are repeated, each one overlapping its predecessor toward the wrist for one-half of its width, till the dorsal surface of the metacarpus is completely covered, when the bandage is completed by a circular turn around the wrist. The angles made by the crossing of the ascending and descending turns should be placed exactly in line with each other, slightly toward the palmar surface of the thumb.

The *ascending spica* is formed in the same way, excepting that

the first crossing turns are made as near the wrist as possible, and the subsequent turns overlap toward the phalanx.

Describe the demi-gauntlet.

This roller should be three yards long and one inch in breadth.

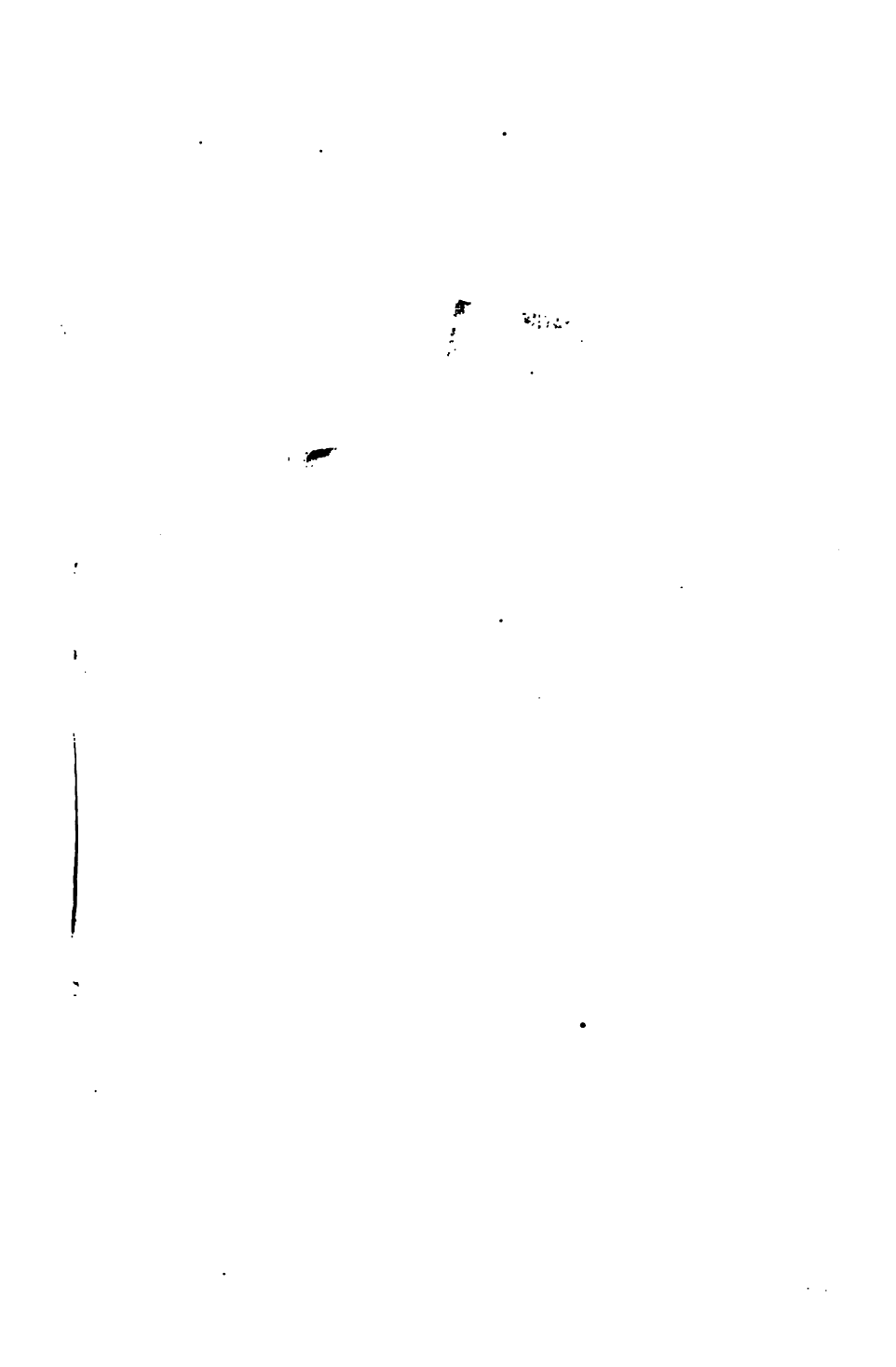
It is fixed by a double circular turn at the wrist ; it is then carried obliquely across the back of the hand to the index finger of the right side, the little finger of the left. It is looped around the finger and carried back to the wrist ; after a circular turn it is again carried across the dorsum of the hand and looped around the next finger, and again carried to the wrist. By the same turns loops are carried around the remaining two fingers. On the completion of the bandage the back of the hand is practically covered in, the fingers being left free.

This dressing is useful for retaining dressings to the back of the hand.

Describe the spiral reversed of the upper extremity.

This bandage should be twelve yards long and one and one-half inches in width. It should be applied, when possible, with the back of the patient's hand turned toward the face of the dresser.

The bandage is fixed by a repeated circular turn at the wrist ; it is then carried obliquely across the back of the hand and circularly around the four fingers, held in close apposition, at the level of the second joint of the little finger. Two or three spiral reversed turns are now made, running up the hand to the web of the thumb, the angle of reverses being directly in the middle line. The remaining portion of the dorsum of the hand, and the metacarpal bone of the thumb are covered in by two or three figure-of-eight turns. These are made by continuing the bandage obliquely downward, around the thenar eminence of the right hand, the hypo-thenar eminence of the left, across to the opposite border of the hand and up again over the dorsum, the upper border of the bandage making an angle with the upper border of the descending turn, which is in line with the angles formed by the reverses. These turns are overlapped toward the wrist until the back of the hand is entirely covered. The wrist and lower portion of the forearm are now included in two or three circular turns. As soon as the forearm begins to increase in size, spiral reverses will be required to make the bandage fit neatly.



These are made as described above. The body of the roller is turned over, so that its upper border looks downward, the roller is passed beneath the arm from the right to the left hand, and the bandage is drawn taut so that the fold lies perfectly smooth. The roller is carried over the limb and is again passed to the right hand, and another reverse is formed. This is continued until the elbow is reached. Here figure-of-eight turns are required, though reverses may be used. The former, however, hold their position much better. The figure-of-eight turns are made by carrying the bandage upward obliquely across the bend of the elbow to a position somewhat above the condyle; here the bandage is continued around the back of the arm, till it reaches a point above the opposite condyle; it is then carried obliquely downward, forming an intersection with the first turn, and around the back of the forearm, overlapping the upper spiral reversed turn toward the elbow joint. It is again carried across the front of the elbow and around the back of the arm, overlapping the preceding turn downward; these turns are repeated until those overlapping downward and those overlapping upward are separated posteriorly by a narrow interval; this is covered in by a circular turn, and the bandage is continued up the arm, generally by spiral turns, since this portion of the limb is very nearly cylindrical. If there be much variation in shape or size, however, spiral reversed turns may be required. The bandage is finally completed just below the shoulder by a circular turn, and secured in place by pins.

Describe the spica of the shoulder.

This roller should be ten yards long and two and a half inches wide. The shoulder may be covered in by either causing the turns to ascend or descend; in the *ascending spica* the turns overlap upward, in the *descending spica* they overlap in the opposite direction.

The ascending spica is formed by fixing the bandage by a repeated circular turn around the arm as close to the axillary folds as possible. The bandage is now made to pass obliquely upward, across the circular turn upon the outer aspect of the shoulder, directly across the chest if the dressing is being applied to the right side, or across the back, if the dressing is applied to the left side, beneath the axilla of the opposite side of the body, back again to the injured

shoulder, and across the outer aspect of the arm, intersecting the first turn and forming an angle with it directly in the middle line of the shoulder. The roller is then carried under the axilla, over the shoulder, overlapping the first turn for two-thirds of its width, across the thorax to the opposite axilla, and back again to the side

FIG. 8.



Ascending Spica of the Shoulder.

which is being bandaged, making another angle by intersecting the second turn on the outer aspect of the shoulder. These turns are repeated till the shoulder is covered to the root of the neck, the extremity of the bandage being pinned at any convenient point.

The descending spica differs from the ascending only in the fact that the first spica turns cross at the root of the neck, and are then

overlapped downward till the circular turn about the arm is reached and partially covered in.

This dressing is useful in injuries of the shoulder. It exerts uniform pressure upon this part, if properly applied, and enables dressings to be retained. Care must be taken to see that the axillary turns make no undue pressure upon the blood-vessels.

Describe the Velpeau bandage.

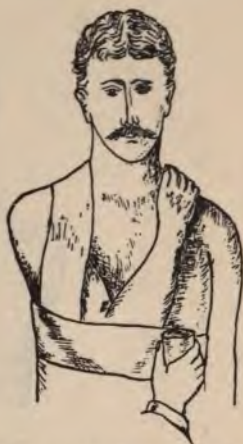
This bandage should be fourteen yards long and two and a half

FIG. 9.



The Repeated Oblique or Shoulder Turn of the Velpeau.

FIG. 10.



The First Circular Turn of the Velpeau.

inches wide. For its proper application the hand of the side to be bandaged must be placed upon the opposite shoulder at the base of the neck, the elbow being closely applied to the chest. As excoriation always results from keeping skin surfaces long in contact, a sheet of lint or absorbent cotton should be placed between the arm and the body.

The initial extremity of the roller is placed at the angle of the scapula of the sound side; the bandage is then carried over the top of the shoulder of the injured side, downward to the outer aspect

of the middle third of the humerus, and thence directly across the chest and around to the point of starting ; this turn is repeated to fix the roller. Having reached the side of the chest in the axillary line of the sound side on repeating this turn, the bandage is carried transversely across the back, around to the front of the body, across the outer aspect of the arm, covering in the external condyle of the humerus at a point so low that the olecranon cannot be seen from the front, and on around to the point of starting, when it is again carried over the shoulder and down across the middle third of the humerus, overlapping the first shoulder turn at this point for about

FIG. 11.



Velpeau Completed.

five-sixths of its width. Another circular turn of the bandage is now made about the body, overlapping the first circular turn for about one-third of its width ; this is followed by a shoulder turn overlapping as before (five-sixths). The bandage is continued by alternating the shoulder and the circular turns, and the overlapping is so planned that by the time the shoulder turns have reached the point of the elbow the circular turns have ascended as far as the wrist. The anterior border of the shoulder turns should extend *to but not beyond the olecranon*, as otherwise this last turn is liable to slip, thus loosening the whole bandage. The roller may be pinned

at any point where it ends, preferably somewhere in the axillary line, or posteriorly, where the terminal extremity is out of sight.

This bandage is useful in the treatment of fractures of the clavicle.

Describe the Désault roller.

For this bandage a wedge-shaped pad and three distinct rollers are required. The first roller fixes the pad in the axilla, the second secures the arm to the side, and the third, by pressure upon the dorsal surface of the upper portion of the forearm, forces the shoulder upward and backward.

FIG. 12.



Désault—First Roller.

FIG. 13.



Désault—Second Roller.

The first roller should be five yards long and two and a half inches wide.

The pad being placed in the axilla of the injured side, with its base applied to the axillary folds, four spiral turns are passed about the chest and over the pad, securing the latter in position. To prevent these turns from slipping down, the bandage is further secured by passing it obliquely across either the chest or the back, depending upon whether the dressing is applied to the left or the

right side, over the top of the shoulder, under the axilla of the sound side, and back again to the position of the pad. The roller is then continued across the opposite aspect of the thorax, over the shoulder and beneath the axilla of the sound side, and is carried back to the pad. Two or three of these turns are made, holding the bandage firmly in place.

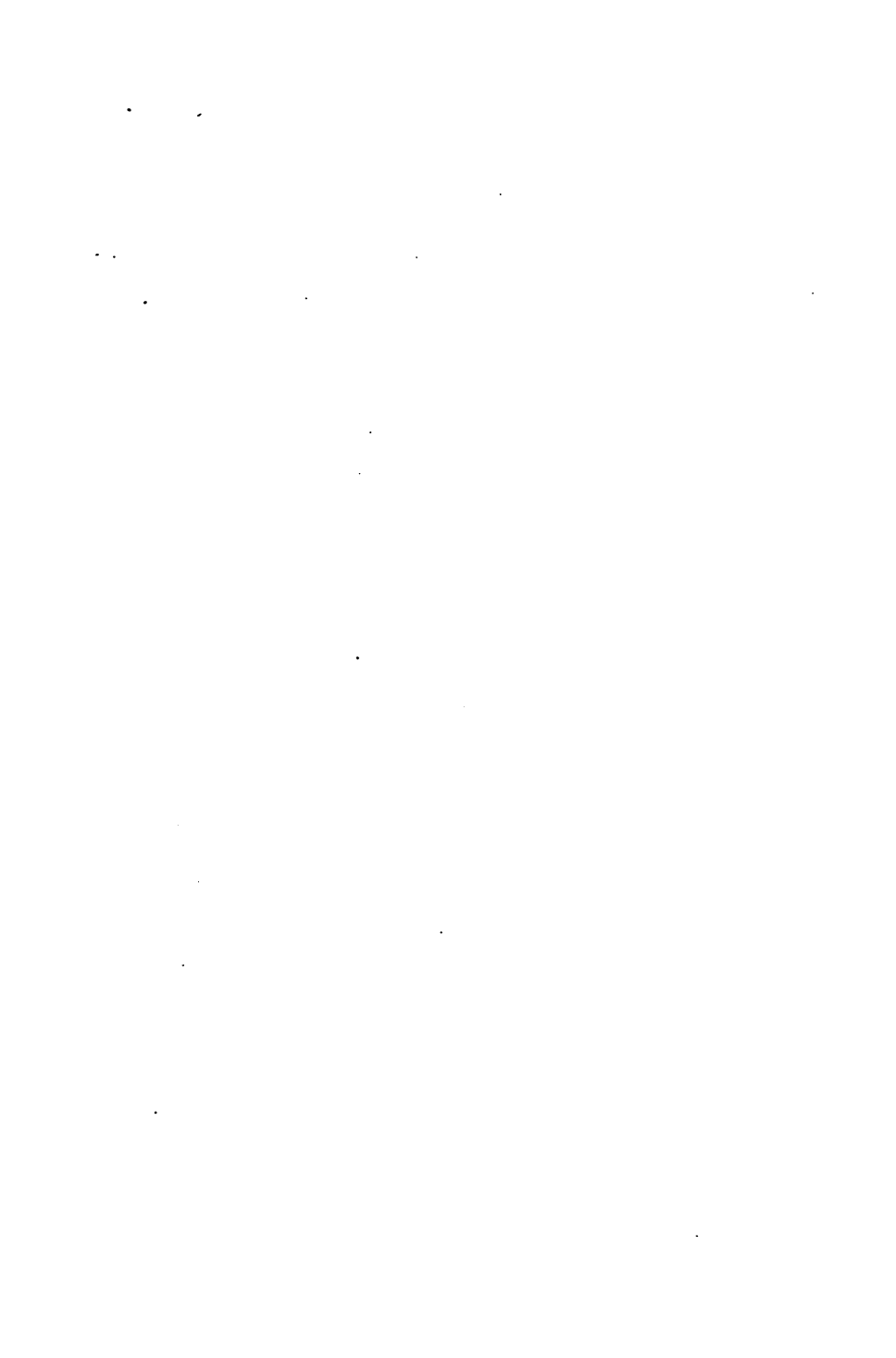
FIG. 14.



Désault—Third Roller—Rear View.

The second roller should be seven yards long and two and one-half inches wide.

It is made up of spiral turns embracing the chest and the arm of the injured side, and overlapping downward from the point of the shoulder to the olecranon. The upper turns are applied loosely; the lower are drawn as tight as is compatible with the comfort of the patient. The object of these turns is to force the shoulder outward



by drawing the elbow close to the side, the axillary pad acting as a fulcrum ; each turn should overlap its predecessor for two-thirds of its width.

The third roller should be seven yards long and two and one-half inches wide.

Its proximal extremity is fixed in the axilla of the sound side ; the body of the bandage is then carried obliquely across the chest,

FIG. 15.



Désault—Third Roller—Completed Bandage.

over the top of the injured shoulder, down along the posterior surface of the humerus, and forward and upward around the upper fifth of the ulna (the forearm being flexed at a right angle and lying across the chest) to the point of starting. It is then continued posteriorly across the upper portion of the scapula of the sound side over the top of the injured shoulder, directly downward from this point, parallel with the humerus, to the upper fifth of the forearm, around the back of which it is carried, and is then continued

upward and backward across the dorsal surface of the thorax to the point of starting. These turns are repeated at least three times, each one exactly *overlying* and not overlapping its predecessor. The bandage may be pinned at any convenient point. The dressing is finally completed by slinging the forearm at the wrist.

The Désault bandage is applied in the treatment of fractures of the clavicle. The third roller is useful in dressing fractures of the acromion or coracoid process, or of the anatomical neck of the humerus. It is sometimes applied in the after-treatment of luxations of the humerus.

Describe the spiral of the chest.

This requires a roller seven yards long and from three to six inches in width.

The bandage is started by a circular turn around the waist, once repeated. The roller is then carried up to the axilla by successive spiral turns, each overlapping its predecessor by one-half the width of the bandage. When the whole chest is thus covered in, the bandage is further secured by pinning it in front, carrying it over one shoulder, and pinning it behind to the circular turns. From the second point of fixation the bandage is carried over the opposite shoulder and is finally pinned to the circular turns in front. This practically forms a pair of suspenders for the dressing and prevents it from slipping down. The circular turns should be further pinned to each other.

Describe the anterior figure-of-eight of the chest.

This requires a roller about seven and a half yards long and two and a half inches wide.

It is fixed by a circular turn about the upper portion of the right arm. The bandage is then carried over the top of the shoulder, across the chest, beneath the axilla of the left side, over the top of the shoulder and obliquely downward over the front of the chest again to the axilla of the right side; up behind the shoulder and over it, obliquely downward to the opposite axilla; these turns are continued until as many as are required have been applied.

This dressing is useful for approximating the shoulders and for retaining applications to the front of the chest.

Describe the posterior figure-of-eight of the chest.

This bandage differs from the anterior figure-of-eight only in the fact that it is started by a repeated circular turn about the *left* humerus, as near the axillary folds as it can be applied. The roller is then carried upward over the top of the shoulder, across the back to the right axilla, over the top of the right shoulder and back again across the back to the left axilla; these turns being repeated, excepting the circular one about the arm, and as many being applied as are required.

This dressing is sometimes used in the treatment of fractures of the clavicle, or may be employed to retain applications to the dorsal aspect of the chest.

FIG. 16.



Double Spica of the Breast.

Describe the spica of the breast.

This roller may be *single* or *double*, depending upon whether one or both breasts are to be included.

The single spica of the breast requires a roller ten yards long and two and one-half inches wide.

The initial extremity of the bandage is fixed at the angle of the scapula of the affected side; the bandage is carried upward to the top of the shoulder on the sound side, over this, downward across the chest so that the upper border of the bandage just includes the lower limits of the mammary gland, and on to the point of starting. This turn is repeated to secure the initial extremity of the roller. When, on repeating this turn, the lower border of the breast is reached, the bandage is carried, circularly, completely around the

chest, its lower border intersecting, below the breast and slightly beyond the nipple line, the first oblique turn. It is then continued to the point of starting, where it follows the course of the first turn over the top of the sound shoulder and down beneath the affected breast, overlapping its predecessor for two-thirds of its width. Another circular turn is now applied, overlapping upward to the same extent. These turns are repeated, alternating the oblique over the shoulder with the circular turns about the chest, till the breast is completely covered in. The angles formed by the intersection of these turns at the outer side of the breast should all lie in a straight line, parallel to the long axis of the body.

The double spica of the breast requires a roller fourteen yards long and two and a half inches wide. Since bandages of this length are difficult to manage on account of their bulk, it is customary to use two bandages, pinning the terminal extremity of one, after it has been applied, to the initial extremity of the other.

This bandage is started by placing the initial extremity of the roller at the angle of the left scapula; the bandage is carried upward over the right shoulder, downward under the left breast and back to the point of starting; this turn is repeated, for the purpose of fixing the initial extremity. The roller is then carried directly across the back and around the side of the chest till it passes beneath the right nipple, its upper margin just including the lower border of the mammary gland. From this point it is carried obliquely upward across the chest, over the top of the left shoulder, and obliquely downward over the back and toward the right side; a circular turn is then made about the entire chest, after which another oblique turn is formed, passing over the right shoulder and under the left breast, across the dorsal aspect of the thorax, around the side of the chest, under the right breast, upward across the front of the chest, and over the top of the left shoulder, after which a second circular turn is made. Each of these turns overlaps its predecessor for two-thirds of the width of the bandage.

In this double spica of the breast there are two oblique shoulder turns for each circular chest turn, the left breast being taken in by a turn passing downward from the right shoulder, the right breast by a turn passing upward toward the left shoulder, before the bandage is carried completely around the chest.

In case of abscess, or swelling of the breast, this bandage is sometimes used. It enables very firm pressure to be applied to this region.

Describe the spica of the foot.

This requires a roller five yards long and two and a half inches wide.

It is started by a repeated circular turn about the ankle. The roller is then carried across the dorsum of the foot to the metatarso-phalangeal articulation of the great toe; at this point a circular turn is made about the foot, and to this is added a spiral turn, overlapping the circular turn upward for three-fourths of its width; the roller is then carried over the dorsum of the foot, along its lateral aspect, and around the back of the heel, so that the lower border of the bandage is a trifle below the level of the sole; the roller is carried back from the heel along the side of the foot, and over its dorsum, crossing the beginning of the turn which passes around the heel exactly in the middle line. The bandage is again passed around the sole of the foot, across its dorsum, along the side, around the back of heel, and back again to the dorsum, intersecting the beginning of the second heel turn at this point. These turns are continued till the whole foot is completely covered in, excepting a small portion of the sole of the heel, when the bandage may be either cut and pinned at the ankle, or may be carried up the leg. The spicas or angles of intersection of the turns passing across the dorsum of the foot should all lie precisely in the middle line. Each of these figure-of-eight turns must be, through its whole extent, parallel to its predecessor, and must overlap for three-fourths of the width of the bandage.

This bandage affords a ready means of exerting a firm pressure upon the whole surface of the foot.

Describe the spiral reversed of the foot covering in the heel.

This requires a roller four yards long and two and one-half inches wide.

The bandage is fixed by a repeated circular turn about the ankle; it is then carried obliquely down over the top of the instep and a circular turn is made around the foot at the level of the metatarso-phalangeal

FIG. 17.



Spica of the Foot.

articulation of the great toe. The dorsum of the foot is now covered in by three spiral reversed turns, each overlapping toward the

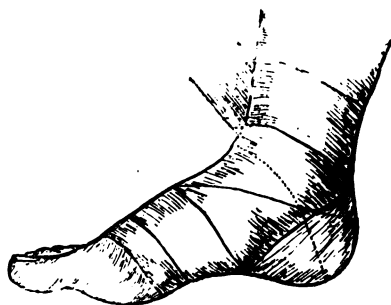
FIG. 18.



Spiral Reversed Covering in the Heel.

ankle two-thirds of the width of the roller, and the angle of reverses being kept in the middle line. When the top of the instep is

FIG. 19.



reached the bandage is carried over the dorsum of the foot, around the point of the heel, back to the dorsum of the foot, down around

the sole of the heel, obliquely upward and backward from this point behind the malleolus and around the back of the heel, forward over the malleolus, over the top of the instep, downward again across the sole of the heel, upward and backward behind the malleolus, across the back of the heel and across the malleolus and the dorsum of the foot. The bandage may be further secured by an added circular turn, passing from the top of the instep around the point of the heel. It is terminated by one or two turns about the ankle. These heel turns can be applied by remembering that the bandage

FIG. 20.



Spiral Reversed of the Lower Extremity.

FIG. 21.

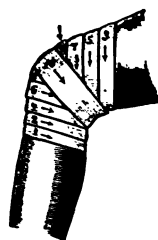


Figure-of-eight for the Knee.

goes *over* the instep, *under* the heel, *back* of the heel, the words *over*, *under* and *back* conveniently summarizing the direction in which the roller should be carried.

In wounds or in pathological conditions of the heel this bandage will be found useful.

Describe the spiral reversed of the lower extremity.

This requires a roller twelve yards long and two and one-half inches wide.

The bandage is started by a repeated circular turn about the ankle. It is then carried obliquely down over the top of the instep,

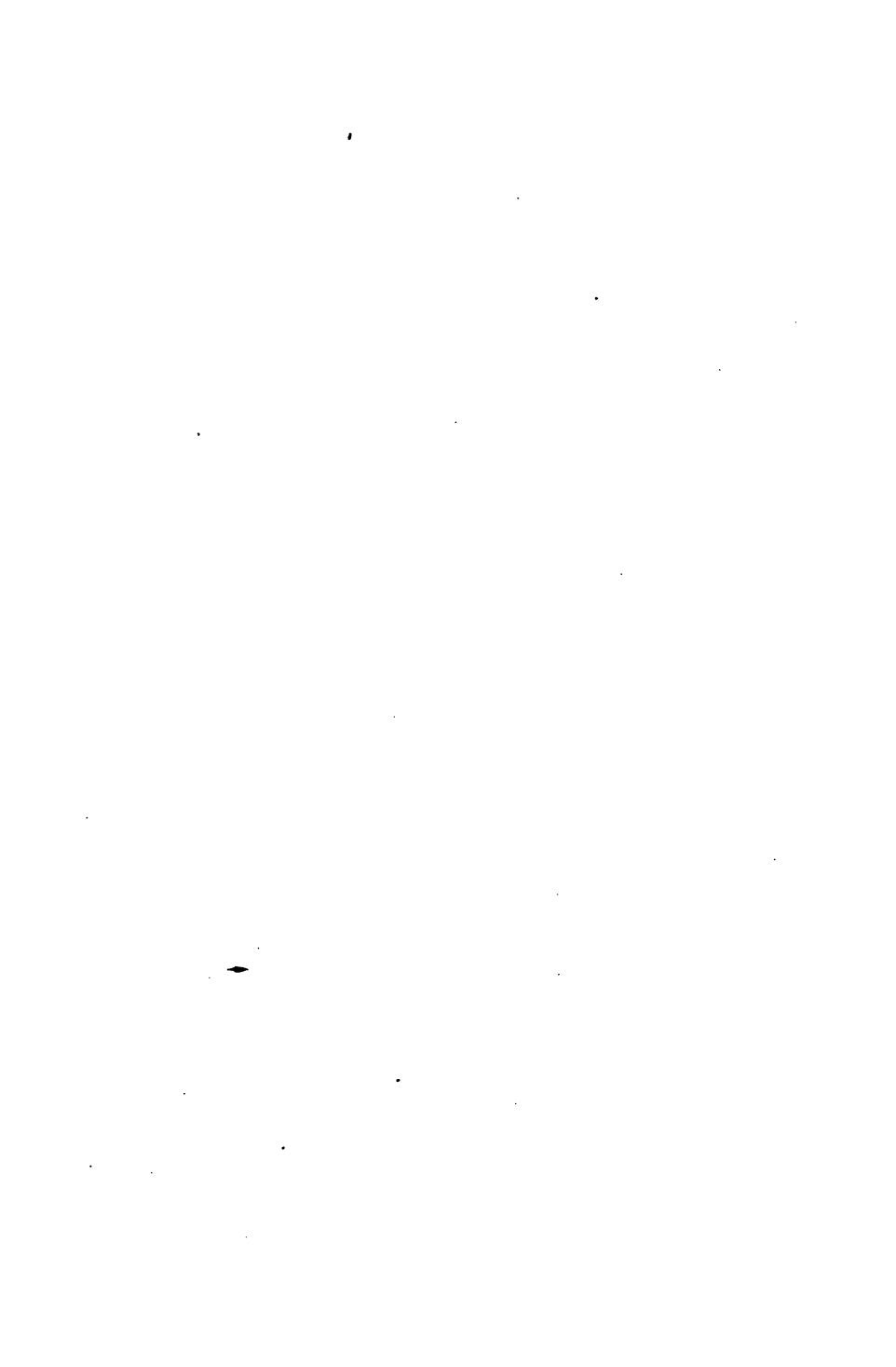
and around the foot at the level of the metatarso-phalangeal articulation of the great toe. The instep is covered in either by spica turns, as in the case of the spica of the foot, or by spiral reversed turns. The heel is left exposed. The bandage is then carried around the ankle and up the leg, beginning the reverses as soon as the increasing diameter of the limb requires it. The knee may be covered by spiral reversed turns or by the figure-of-eight of the knee. If the latter is employed the bandage is carried upward across the popliteal space, around the front of the thigh, downward across the popliteal space, and around the front of the upper portion of the leg, overlapping the last spiral reversed turn for two-thirds of its width. The roller is again carried across the popliteal space and around the thigh, overlapping downward the previous turn in this region for two-thirds of its width. It is now carried down again and around the leg, overlapping toward the patella. These turns are continued, both the upper and lower overlapping toward the patella, till the descending and ascending turns almost meet, when the remaining space is covered in by a circular turn passing directly across the centre of the patella. The bandage is now continued up the thigh by spiral reversed turns until the groin is reached. It may be pinned at this point, or further secured by one or two spica turns of the groin.

Describe the spica of the groin.

The spica of the groin may be either *single* or *double*, depending upon whether one or both groins are included in the dressing; further, it may be either *ascending* or *descending*, depending upon whether the overlapping is from below upward or in the reverse direction.

The single ascending spica of the groin requires a roller ten yards long and two and a half or three inches wide.

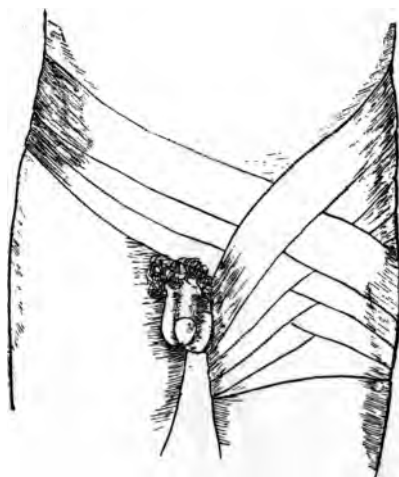
The bandage is fixed by a repeated circular turn applied as close to the ileo-femoral fold as possible. If the right side is being dressed the bandage is then carried obliquely across the pubes, around the body beneath the iliac crest of each side, and down across the right thigh, intersecting the beginning of the body turn and forming the first angle or spica, which should be placed slightly to the inner side of the middle line of the anterior surface of the thigh. The band-



age is then carried around back of the thigh, forward across the front, overlapping the first turn for two-thirds of its width, around the body and back again across the thigh, making the second angle of crossing. These turns are repeated, overlapping upward till a sufficient surface is covered in. The bandage may be secured by a circular turn around the waist.

The descending spica of the groin is similar in its turns to the

FIG. 22.

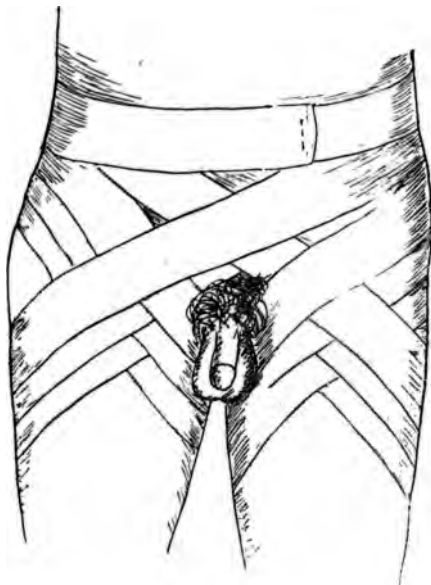


Single Ascending Spica of the Groin.

ascending, excepting in the fact that the first intersection or crossing of the bandage is carried far above the circular turn around the thigh, in place of overlapping it. This is accomplished by carrying the bandage, after the double-thigh turn has been made to fix it, across the front of the belly some distance above the pubes, and around the body above the crest of the ileum. Each succeeding turn overlaps downward until the last spica overlaps the circular turn about the thigh.

The double spica of the groin requires a bandage fourteen yards long and two and one-half inches wide. It is fixed by a circular turn around the waist once repeated; the roller is then carried obliquely downward across the belly, across the fold of the left groin, around the back of the left thigh, forward and upward parallel to Poupart's ligament, forming the first intersection with the turn passing down-

FIG. 23.



Double Spica of the Groin.

ward, around the back, downward parallel to the right Poupart's ligament, around the back of this thigh, upward and across Poupart's ligament, forming the second intersection, and across the belly, forming with the first oblique abdominal turn the third intersection. These turns are repeated, being carried around the back, around the left thigh, around the back, around the right thigh, around the



back, and so on until the required surface is covered in. The bandage may overlap upward or downward, forming either the *ascending* or the *descending double spica of the groin*.

HEAD BANDAGES.

Describe the Barton bandage.

This requires a bandage five yards long and two inches wide.

The dresser, standing in front of the patient, places the initial extremity of the roller directly behind the left ear; the body of the

FIG. 24.



Barton's Bandage.

bandage is carried downward under the occiput, and upward behind the right ear, then directly across the top of the head from the right to the left side, downward in front of the left ear, under the chin, upward in front of the right ear, and across the top of the head, from

the left to the right side, to the point of starting ; thence across the junction of the occiput and back of the neck, directly forward under the ear, along the ramus of the lower jaw, around the symphysis or front of the chin, back again along the ramus of the lower jaw, and beneath the right ear to the upper portion of the back of the neck. From this point the bandage is carried upward behind the right ear across the top of the head, and is continued exactly as were the first turns. These turns are repeated three times.

Note that each succeeding turn overlies and does not overlap its predecessor, and that the angle made by the crossing of the bandage

FIG. 25.

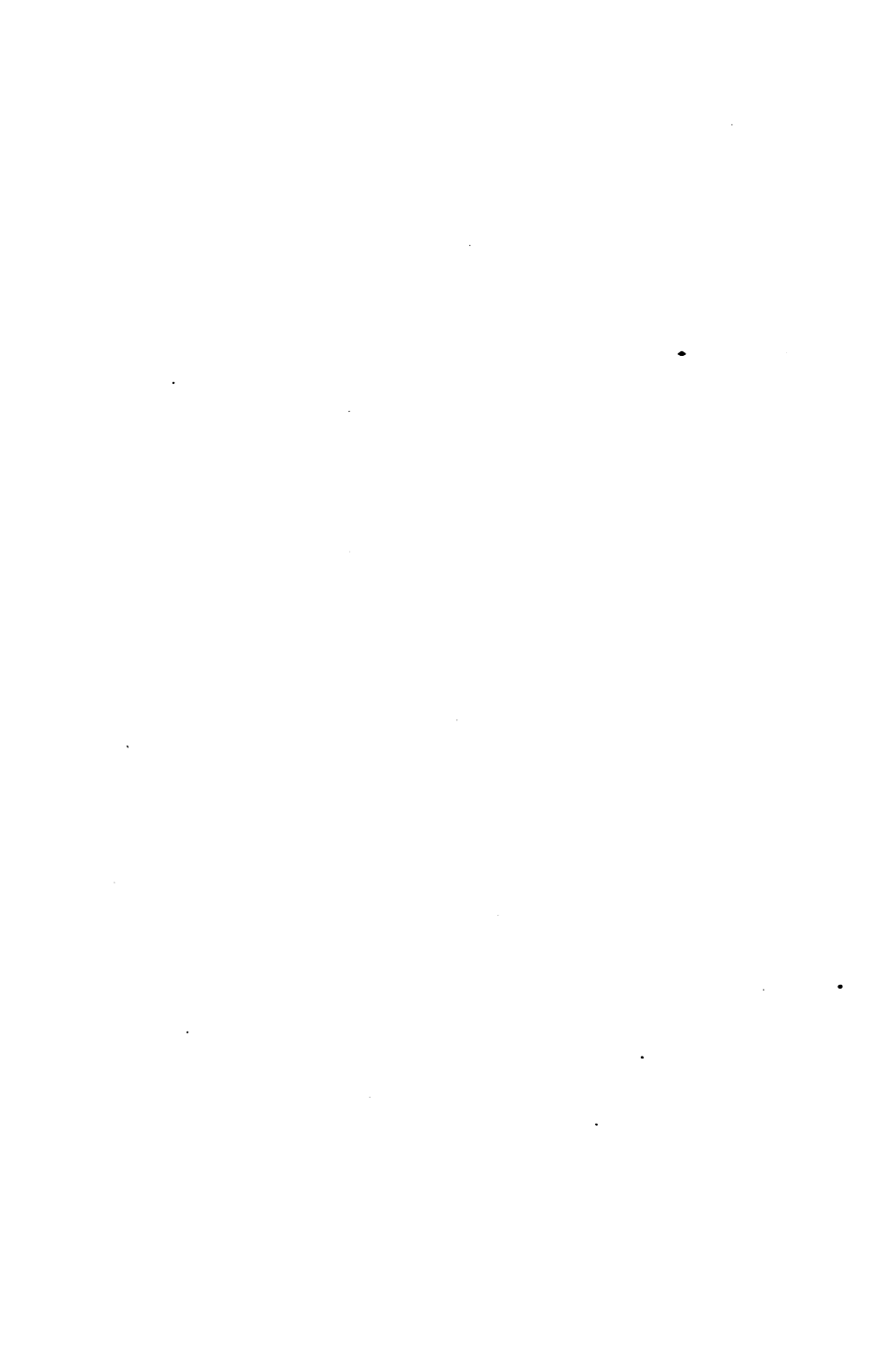


on top of the head, must be exactly in the middle line, and its anterior margin must lie about two inches posterior to the junction of the scalp and forehead. All the intersections of this bandage are pinned. It may be made still more secure by carrying an additional circular turn from the occiput around the forehead.

This dressing is useful in the treatment of fractures of the jaw. It is also of service when tight pressure is required at any portion of the surface covered by it.

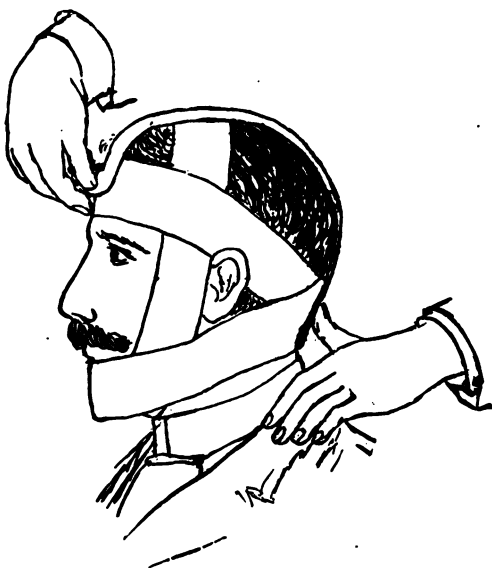
Describe the Gibson bandage.

This requires a roller five yards long and two inches wide.



The initial extremity is placed upon the top of the head, and the roller is carried downward in front of one ear, under the chin, upward in front of the other ear, and on to the point of starting. This turn is twice repeated, when the bandage is reversed in the temporal region above the ear, and carried around the head three times, including the forehead, the temporal regions and the occiput; on

FIG. 26.



Gibson's Bandage.

the completion of the third turn the bandage is carried obliquely downward behind the ear to the back of the neck, forward along the ramus of the jaw, around the front of the chin, and backward along the opposite side of the jaw to the back of the neck; this turn is repeated three times. The bandage is then completed by reversing it in the posterior middle neck line, and carrying it directly forward to the frontal part of the circular occipito-frontal turn. All the intersections are pinned.

In applying this bandage each turn overlies its predecessor, and does not overlap. The difficult part of the dressing is the proper securing of the first vertical turns. Where the head slopes forward from the vertex, these are liable to slip forward; they should always be passed over the top of the head as far back as possible.

This dressing is applicable to the treatment of fractures of the jaw, but is not so satisfactory as the Barton bandage.

Describe the oblique of the jaw.

This requires a bandage five yards long and two inches wide.

FIG. 27.



Oblique Bandage of the Jaw.

Facing the patient the dresser starts the bandage by placing its initial extremity upon the forehead, and carrying the body of the roller *toward the injured side* and circularly around the head. This fronto-occipital turn is repeated to fix the bandage. It is then carried above the ear of the injured side, obliquely downward behind it to the back of the neck, around the front of the neck to the angle of the jaw of the affected side, thence upward in front of the ear, directly across the top of the head, downward behind the ear of the opposite side, around under the chin, upward again in front of the ear of the

injured side, overlapping forward for three-quarters of the width of the bandage, across the top of the head, downward behind the opposite ear, and so continued until a sufficient number of turns have been applied, when the bandage may be made still more secure by reversing above the ear and adding a circular turn including the occiput and forehead. All intersections are pinned.

This dressing is of service in the treatment of injuries and wounds of the parotid region. It is commonly advised in the dressing of fractures involving the neck of the condyle of the lower jaw. It is, however, difficult to understand how it can be of special service when applied to this form of injury.

FIG. 28.



Recurrent of Scalp.

Describe the recurrent of the scalp.

This bandage should be seven yards long and two inches wide. It is fixed by repeated circular turns around the forehead and occiput. At the middle of the forehead the roller is reversed, is secured by the thumb of the dresser or an assistant, and is carried directly back across the top of the head until it reaches the lower border of the occipital turn; here it is again reversed, the reverse is secured by an assistant, and the bandage is carried directly forward, overlapping the preceding turn for three-quarters of its width; having reached the frontal portion of the circular turn, it is caught by the thumb again and carried directly backward. The bandage is carried to and fro in this way until half the scalp is covered in, when these loopings are fixed by a circular turn. The bandage is again reversed

at the forehead and the other side of the scalp is included in a similar manner. The dressing is completed by a repeated circular turn, pins being applied to further secure the loops of the reverses. These reversed turns should converge in front and behind to the central points of the forehead and occiput.

This bandage is of service in retaining dressings to the upper part of the scalp. In applying it care must be taken that the circular turn passes from the forehead around the head *beneath the superior curved line of the occiput*; there is then no tendency for the dressing to slip off, since before it can be removed the circular turn **must** pass over a greater diameter than it already embraces.

Describe the figure-of-eight of the eye.

This bandage may be either single or double, depending upon whether one or both eyes are included. The initial extremity of the roller is placed at the middle of the forehead and the bandage is carried away from the injured eye, making a repeated fronto-occipital circular turn; on the third turn the bandage is carried downward behind the ear of the sound side, around the back of the neck just under the occiput, forward and upward under the ear of the affected side, obliquely across the eye, around the side of the head, thence downward around the back of the occiput, under the ear of the affected side, upward across the eye, overlapping for two-thirds of the width of the bandage either upward or downward as may be required. These oblique turns are repeated until the eye is completely covered in; more than two or three are rarely required. The bandage is then completed by a fronto-occipital turn and all intersections are pinned. For neat bandaging each oblique turn may be alternated with a circular one, both sets of turns overlapping and forming a series of angles in the middleline.

The double figure-of-eight of the eye requires a bandage seven yards long and two inches wide; each eye may be covered in independently by the turns employed in the single bandage. In this case, after one eye is completely covered, the bandage is carried by a circular turn to the forehead, and is then continued downward across the other eye and under the ear, upward over the parietal eminence, again across the eye and so continued till a sufficient number of turns are applied, when the dressing is completed by a cir-

cular turn ; or the bandage having been fixed by a repeated circular turn as in the single figure-of-eight, is carried under the ear and over the eye as before, then around the occiput, forward over the ear, obliquely downward over the opposite eye, thence under the ear, around the back of the neck, under the opposite ear, obliquely upward over the eye, around the occiput again, forward and downward across the opposite eye and so continued, forming two or three angles of intersection in line with the bridge of the nose and over-

FIG. 29.

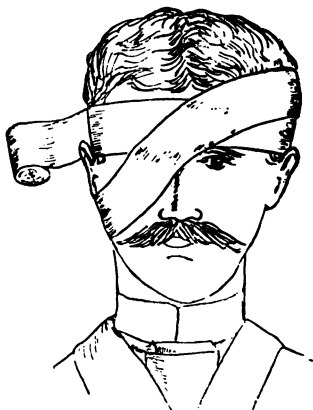


Figure-of-Eight of One Eye.

FIG. 30.



Figure-of-Eight of Both Eyes.

lapping regularly upward. The dressing may be secured by one or two-circular fronto-occipital turns.

The applications of this bandage are obvious.

As a matter of clinical experience it is found best to employ thin flannel cut bias for these bandages, since otherwise undue pressure may be exerted. The comfort of the patient will be further consulted by placing small pads of cotton in and behind each auricle and passing the bandage directly over these organs, in place of making an effort to leave them free

Describe the occipito-facial bandage.

This requires a roller four yards long and two inches wide.

The initial extremity of the bandage is placed upon the crown of the head, or, if the latter does not slope abruptly forward, two inches anterior to this point ; the roller is then carried downward under the chin and upward to the point of starting ; this turn is repeated twice ; the bandage is then reversed just above the position of the ear, and three circular turns are made embracing the occiput and forehead ; the intersections are pinned.

FIG. 31.



Occipito-facial Bandage.

This bandage may be employed to make pressure in the submental region, or upon any part of the scalp covered by it.

Describe the fronto-occipito-cervical figure-of-eight.

This requires a bandage three yards long and two inches wide.

It is fixed by a repeated fronto-occipital turn placed just above the ear, the bandage is then carried obliquely downward behind the ear, across the back of the neck, forward around the front of the neck, to the back of the neck again, obliquely upward above the opposite ear,

across the forehead, downward behind the ear again and around the neck, and is so continued till three complete turns are made, when it is pinned at any convenient point.

This bandage is useful in retaining dressings to the back of the neck.

Describe the fronto-occipito-mental figure-of-eight.

This requires the same length of bandage as the preceding, and is applied in exactly the same way, except in place of carrying a turn around the neck it is carried around the front of the chin. This enables the dresser to apply much more pressure than is possible in the preceding bandage.

Describe the T bandage.

Two strips of bandage, each four feet long and three inches in width, are required; to the middle of one strip, and passing at right angles to it, one extremity of the other strip is pinned or sewed.

This bandage is of use in retaining dressings to the rectum or perineum. The horizontal limb is secured around the waist, the vertical limb is carried down along the perineum and is brought forward. It is then split down to the scroto-perineal junction, and the two ends are carried upward and forward, one to each side, and are secured to the circular turn around the body.

Describe the many-tailed bandage.

This was originally called the bandage of Scultetus, and consisted of a number of short pieces of bandage, often as many as 18 or 20, each placed parallel to its predecessor and overlapping for two-thirds of its width. These pieces were secured in their relative positions by being stitched to another piece passed vertically along their middle. If a limb were to be bandaged, all of the imbricated pieces could be slipped under at once; the limb could then be allowed to rest upon the bed and the pieces could be folded over, commencing at one end and folding over in turn each extremity of every piece, passing upward. In this form the bandage is now rarely used, since frequent dressing of parts which cannot be readily moved is not so often required.

The many-tailed bandage commonly used is made of a piece of flannel or muslin from six to eight inches in width, and of sufficient

length to go one and one-half times around the part to be bandaged. The strip is torn from each extremity toward the middle for about one-third of its length ; two or three tears are made in such a way that the extremities are divided into three or four pieces of equal width.

This bandage is very useful in making pressure and in retaining dressings after laparotomy.

Describe the four-tailed bandage.

This requires a piece of muslin from four to twelve inches in width and from eighteen to twenty-four inches in length. It is torn down the centre from each end to within from two to six inches of its middle.

This bandage is sometimes used in the treatment of fractures of the lower jaw or in fractures of the clavicle.

Describe the crossed bandage of the perineum.

This requires a bandage seven yards long and two and a half to three inches wide.

It is fixed by a circular body turn around the pelvis, placed beneath the iliac crests. It is then carried downward along the right groin, across the perineum, around the back of the left thigh at the position of the ilio-femoral fold, upward above the trochanter and below the crest of the ileum, completely around the body until it is just above the left trochanter, down along the left groin, across the perineum, around the back of the right thigh at the ilio-femoral fold, upward and forward just above the right trochanter, and is continued by repeating these turns till a firm dressing is formed.

This bandage is useful for retaining dressings to the scrotal and perineal regions.

Describe the figure-of-eight bandage of the lower extremity.

This requires a bandage $2\frac{1}{2}$ inches wide and 12 yards long ; the bandage is fixed by a repeated turn around the ankle ; it is then carried across the instep, around the foot, and up to the ankle by one or two reversed turns. It is carried around the ankle again and up the leg by one or two spiral turns overlapping for two-thirds of the width of the bandage. The roller is then continued by an oblique turn to that portion of the leg just below the knee joint where the calf

grows smaller ; it is carried around the leg at this point and continued obliquely downward again until it overlaps the spiral turns above the ankle. It is brought around the back of the leg and carried obliquely upward, catching again upon the lesser diameter above the calf ; it is then continued downward, overlapping the preceding turn upward. These turns are repeated until the whole leg is covered in.

This bandage is exceedingly useful, from the fact that it remains indefinitely upon a muscular calf, even though the patient be active upon his feet.

HANDKERCHIEF BANDAGES.

Describe the handkerchief bandage.

This requires muslin, calico, or any thin, strong, soft fabric cut in the form of either a *square* or a *triangle*. The square should measure thirty-two inches.

The *triangle* is made by dividing this square obliquely across from angle to angle, or by simply folding the square in the form of a triangle. The parts of the triangle are the *base*, the *apex* (the angle opposite the base), and the *angles* or *ends*.

The *cravat* is formed by folding the apex in toward the base and repeating the folding till a bandage about two inches in width is formed.

The names of the handkerchief bandages have been devised with the idea of indicating their method of application ; the first name is that of the part to which the base of the triangle is applied, the second name is that of the part around which the ends are carried. Thus the occipito-frontal triangle would imply that the base of the bandage is applied to the occiput and that the ends are carried around the forehead.

Handkerchief Bandages of the Head.

How is the occipito-frontal triangle applied ?

Apply the base to the occiput, letting the apex fall over the forehead. Carry the two ends forward around the head and tie in front,

or cross, and pin at the sides. Turn the apex up and pin to the body of the bandage.

How is the fronto-occipital triangle applied ?

As the preceding, except that the base is applied to the forehead, and the apex falls over the occiput.

How is the bi-temporal triangle applied ?

As the preceding, except that the base is applied over one temple, the apex falls over the other.

In the choice of these three bandages, the base is applied over the seat of injury, or where most pressure is desired.

FIG. 32.



Beginning of Square Cap of Head.

FIG. 33.



Square Cap of Head Completed.

How is the vertico-mental triangle applied ?

Apply the base to the vertex with apex back ; carry the ends down under the chin, and either tie, or cross and pin. Bring the apex to one side and pin.

How is the auriculo-occipital triangle applied ?

This does not conform to the rule in naming. Place the base in front of the ear, apex back, carry one end under the chin, the other over the top of the head and tie or pin in front of the ear on the sound side.

How is the square cap applied ?

Fold the handkerchief so that a quadrilateral is formed, with one

border overlapping the other three inches. Apply this quadrilateral to the scalp, with the projecting border next the surface and hanging over the eyes. Bring the ends of the short fold under the chin and tie. Fold back the long border exposing the forehead, pull the ends forward till the bandage fits about the head, then carry them back and tie beneath the occiput.

How is the fronto-occipito-labialis cravat applied?

Fold the triangle into a cravat. Place the body upon the forehead, carry the ends back, cross at the back of the neck, and bring them forward, tying or pinning over the upper or lower lip, as required by the injury. Used to approximate lip wounds, and to check bleeding from the coronary arteries.

How is the occipito-sternal triangle (compound) applied?

Apply a sterno-dorsal (straight around) cravat about the chest. Flex the head upon the chest and apply the base of a triangle, apex forward, to the occiput, carry the two ends down to the sterno-dorsal cravat and secure. The apex of the triangles may be folded back and pinned. Used in cut-throat wounds of the neck.

How is the parieto-axillaris triangle (compound) applied?

Apply an axillo-acromial cravat (around the shoulder). Place the base of a triangle over the parietal eminence of the opposite side, carry the ends around the head and cross them; incline the head laterally, and secure the ends of the triangle to the shoulder cravat.

Used to approximate the lips of wounds at the side of the neck.

Handkerchief Bandages of the Trunk.

How is the axillo-cervical cravat applied?

Place the body of the cravat in the axilla, carry the ends over the shoulder, across each other, and around the neck.

Used to retain dressings in the axilla.

How is the bis-axillary cravat (simple) applied?

Place the body in the axilla, cross the ends over the shoulder and carry one across the chest, the other across the back, to the axilla of the opposite side, where they are tied or pinned.

Used as the preceding bandage.

How is the bis-axillary cravat (compound) applied?

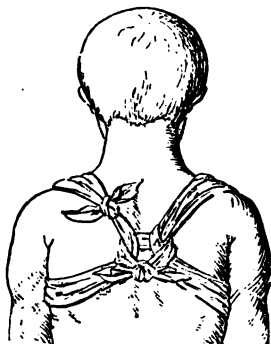
Place the body of one cravat in the axilla, carry its ends over the shoulder and tie (axillo-acromial cravat). Place the body of another cravat in the opposite axilla, and carry the ends obliquely across the chest and back to the first cravat, tying them together when one end has passed through the loop of the first cravat.

Used to retain dressings in both axillæ.

How is the bis-axillo-scapulary cravat (simple) applied?

Place the body to the front of the shoulder, with the lower end one-third longer than the upper. Carry the upper end over the

FIG. 34.



Bis-axillo-scapulary Cravat (Compound).

shoulder, the lower end under the axilla; continue the long end obliquely across the back to the opposite shoulder, around it, and back to the short end, to which it is tied. This forms a posterior figure-of-eight, and is used as a temporary dressing for fractured clavicle.

How is the bis-axillo-scapulary cravat (compound) applied?

Loop one cravat loosely about the shoulder, and tie. Place the body of the other cravat in front of the opposite shoulder, carry the ends back, one over the shoulder, the other beneath the axilla. Tie in a single loose knot, carry one end through the loop of the first cravat, and tie in a double knot.



Used to draw the shoulders forcibly back, as in fracture of the clavicle.

How is the dorso-bis-axillary triangle (compound) applied?

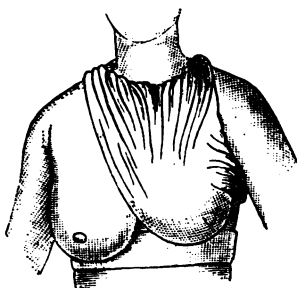
Breakfast shawl. Carry a cravat around the chest and tie in front (dorso-sternal). Place the base of a triangle, apex down, on the back of the neck, carry each end over the corresponding shoulder, and tie to the dorso-sternal cravat in front. The apex is fastened around the body of the cravat behind.

Used to retain dressings to the shoulder or back.

How is the mammary triangle applied?

Place the base of the triangle under the breast, and its apex over

FIG. 35.



Mammary Triangle.

FIG. 36.



Gluteal Triangle.

the shoulder of the same side. Carry one end across the opposite side of the neck, the other under the axilla of the affected side. Tie at the back, and secure the apex beneath the knot.

Used to support the breast, to make pressure, to retain dressings.

How is the scroto-lumbar triangle, or suspensory, applied?

Tie a cravat about the waist. Place the base of a triangle beneath the scrotum, carry the two ends up and secure them to the cravat. Finally secure the apex by carrying it under the cravat, folding it in front, and pinning.

Used as a suspensory of the scrotum.

How is the abdomino-inguinal (simple) handkerchief bandage applied?

For this bandage one long cravat may be made by tying two together. Place the body of the cravat back of the thigh in such a manner that one end may be two-thirds longer than the other. Bring the ends to the front, cross over the groin, and carry them around opposite sides of the body, knotting or pinning in front.

Used as a spica of the groin, to retain dressings on buboes, or to make pressure upon them.

How is the abdomino-inguinal (compound) handkerchief bandage applied?

Place the centre of the cravat (three, knotted or sewed together) over the lumbar vertebræ, carry the two ends forward on each side just below the iliac crests, obliquely downward and inward over the front of the groins, backward between the thighs, outward around each thigh to the front; cross over the pubes and pin to the body of the cravat.

How is the gluteal triangle (compound) applied?

Tie a cravat about the waist. Place the base of a triangle obliquely at the gluteal fold, and tie the ends around the thigh. Carry the apex up and under the cravat, fold it over, and pin.

Used to retain dressings to the gluteal region.

Handkerchief Bandages of the Extremities.**How is the palmar triangle applied?**

Place the base of the triangle on either the palmar or dorsal surface of the wrist, fold the apex over the hand and back to the wrist, carry the ends around the wrist and apex and tie; fold the apex back, and pin to the body of the bandage.

How is the triangular cap of the shoulder applied?

1. Place the base on the shoulder, apex hanging down over the arm; carry the ends under the axilla, across each other, around the arm, taking in the apex, and tie. Fold the apex upward, and pin to the body of the bandage.

2. Place the base of the bandage on the upper part of the arm, with the apex covering the shoulder; carry the ends around the arm,

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cc - Mr. Tolson
Mr. Boardman
Mr. Nichols
Mr. Belmont

Very truly yours,

John Edgar Hoover

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...catch the body
...sands under both
...and, and seeing by
...broken nothing

...the ends justify the means. Use

1. The first step is to identify the problem. This involves understanding the current situation and what needs to be changed.



across each other in the axilla, and up around the shoulder, taking in the apex. Fold the apex down and pin. Used to retain dressings to the upper part of the arm or shoulder.

How is the triangular cap of a stump applied?

Place the base under the stump, carry the apex over its end. Secure the apex by carrying the ends around the limb, and pinning or knotting. Fold the apex up, and pin to the body of the bandage.

How is the cervico-brachial triangle applied?

Sling of the arm. Place the base of a triangle at the wrist of the flexed forearm, carry the ends over the shoulders, around the

FIG. 37.



Cervico-brachial Triangle.

back of the neck, and tie. Draw the apex back beyond the elbow, fold it posteriorly, and pin it in this position. If the triangle is not long enough, a cravat may be tied loosely around the neck, and the ends of the triangle knotted in this.

How is the metatarso-malleolar cravat applied?

Place the body obliquely across the back of the foot, carry one end around the foot, the other around the ankle, and tie in front, over the back of the foot.

How is the malleolo-phalangeal triangle applied?

Place the base in the hollow of the foot. Fold the apex around the toes and in front of the ankle joint. Carry the ends around

the foot, cross on the dorsum, and continue around the malleoli; then back to the dorsum, securing here, or continuing to the side and pinning.

How is the cervico-tibial triangle applied?

Carry a cravat from the top of the shoulder of the sound side to the axilla of the injured side, around the body to the point of starting, and tie. Flex the leg and place the base of a triangle on the tibia just above the ankle. Carry the ends up and tie through the cravat. Bring the apex around the knee, and pin to the body of the handkerchief. Used to support the leg when it is fractured, and the patient is required to walk.

How is the figure-of-eight of the knee applied?

Place the body of the cravat just above the patella, carry the ends back, cross in the popliteal space, bring them forward just below the patella, and tie. Used to approximate the fragments of a fractured patella.

How is the tarso-patellar cravat applied?

Place one cravat as a figure-of-eight of the knee, loop another cravat around the foot, just anterior to the ankle; catch the body of a third cravat through this loop, and carry its ends under both the lower and upper segments of the figure-of-eight, and secure by pinning. Used to approximate the fragments of a broken patella.

How is the tibial cravat applied?

Place the body obliquely across the calf, carry the ends around the leg, one below the patella, the other above the malleoli. Used to retain dressings.

How is Barton's cravat applied?

Place the body of the cravat around the posterior surface of the point of the heel, with the end corresponding to the outer side of the foot one-third longer than the other. Hold the inner end (short) parallel with the foot, while the long end is carried across the instep, turned once around the inner end, across the sole of the foot, and looped around itself as it crosses obliquely over the instep. The two ends are knotted, drawn upon, and the cravat so arranged that traction exerts equal pressure upon dorsum and heel. Used to make extension for fractured femur.

Plaster-of-Paris Dressings.

Describe the plaster-of-Paris bandage.

To be of service, in fixed dressings, plaster-of-Paris must be dry and fresh. The best grade, that used by artists, is to be preferred in surgical practice. It may be applied without previous preparation by making it into a thick paste, by the addition of water, and smearing it generously over a wet muslin bandage after the latter has been applied to a limb, adding one or two more layers of bandage and of plaster, to give additional strength. It is usual, however, to prepare the plaster bandages previously; for this purpose a sufficient quantity of crinoline is procured and cut into strips five yards long and three inches wide; into the meshes of this loose fabric the plaster is then thoroughly rubbed; the strips are rolled loosely and stored in a tight tin can. Where a great many plaster bandages are used, a machine, ingeniously devised for the proper distribution of the plaster through the fabric, may be employed; this may be as well accomplished, however, by the hand. A small quantity of the plaster is poured into a pan or an open newspaper, and by means of the fingers can be evenly distributed through the meshes of the crinoline as the latter is rolled.

The part to be covered is protected from direct contact with the plaster, either by a tightly-fitting garment in which there are no wrinkles, or by a thin flannel bandage; the latter should not be pinned. The rolls of plaster bandage are then placed in water until they are thoroughly soaked through, when the excess of moisture is slowly and gently squeezed out and the bandage is applied with just sufficient pressure to make it lie smoothly, employing as few reversed turns as possible. As the bandage is unrolled an assistant follows it around rubbing in the plaster and making it perfectly smooth with his wet hands. When two or three layers of bandage have been applied a couple of handfuls of dry plaster are mixed with enough water to make a thick paste; this is smeared over the outside of the bandage and smoothed with the hands. In ten or fifteen minutes the bandage should be fairly well set, though several hours must be allowed to elapse before it is put to any special strain. At the position of joints, or at any part of the bandage where breaking from

motion is liable to occur, thin strips of wood, zinc, or other strong material may be incorporated with the dressing. If the plaster bandages are in the first place wet in hot salt water, hardening will take place much sooner. In cleaning the hands after the bandage is applied the dresser should not use soap but should employ simply warm water to which a little washing soda has been added.

The removal of the bandage is, at times, a matter of some difficulty. This may be accomplished most readily by splitting it up with a sharp knife before it is thoroughly hardened. To avoid cutting the surface of the body a narrow lead strip is usually placed outside the flannel bandage, in the long axis of the limb. It should be of sufficient length to project above and below the plaster after it is applied. The cutting can be done safely upon this as a base.

Where the bandage is not previously cut, a little vinegar or dilute hydrochloric acid and a sharp knife will be found far more efficacious than the piers and saw usually employed. The bandage having been wet in the line of incision is quickly and readily cut through, with little disturbance of the parts. The line of cutting should be kept thoroughly wet with the vinegar.

Under what circumstances is the plaster bandage applied ?

1. In the treatment of fractures where deformity is absent or is readily reduced, and where great swelling is not present.
2. In sprains and in chronic inflammations of joints.
3. In diseases, deformities, and injuries of the spinal column.
4. As a permanent splint and dressing after operation upon bones or joints.
5. As a splint after the performance of tenotomy and other orthopædic operations.

How is the plaster-of-Paris bandage trapped ?

The surgeon may desire to inspect a wound or to provide for drainage without removing a plaster bandage. This is accomplished by cutting a trap or window in the dressing. In the region where the opening is desired a thick compress of gauze is placed. This forms a projection, when the bandage is completed, which not only marks the position of the trap, but which enables the dresser to cut through the plaster without fear of injuring the patient.

How is the plaster-of-Paris jacket applied ?

The plaster-of-Paris jacket is applied, in cases of Pott's disease, for the purpose of fixing the spine and to relieve the diseased vertebræ from the weight of the upper portion of the body ; further, a certain amount of extension may be obtained if the dressing is applied carefully.

The body of the patient is first thoroughly cleansed with boric acid lotion ; a tight-fitting undershirt is then put on ; better than this is a stockinette garment or one of silk made to fit perfectly to the figure. In any case the shirt should reach down to below the trochanters of the femur. Bony prominences should be carefully protected by thick pads of absorbent wool *around* such projections. In very thin subjects the iliac crests will require padding. Over the umbilicus a folded towel is placed ; this is called the "dinner pad" and is to be removed after the bandage hardens. In females who have passed the age of puberty the breasts must be protected by thick layers of cotton wool. All padding is placed between the shirt and the skin. When everything is prepared for the application of the plaster the patient is suspended by the head and shoulders ; the extension accomplished by this means must be slight, otherwise it becomes unbearable long before the bandage is completed. Sufficient traction to raise the patient from the ground so that his toes are touching and supporting the major part of his weight is all that is required. Either the regular extension apparatus may be employed, or, in the absence of this, one may readily be improvised. A hook, a cross-beam, or anything over which a rope may be passed, a rope, a stout stick two feet in length, and bandages are sufficient for all practical purposes. A broad bandage is doubled upon itself, and at the point of doubling slit up the middle, in its long axis, for eight inches ; the bandage is opened and the head passed through this slit ; on making traction upward one portion of the bandage catches the occiput while the other supports the chin. This occipito-mental sling is to be secured to the middle of the stick, which is in turn suspended by the rope immediately above the patient's head. At each end of the stick two bandages are looped enabling the patient to support himself by his hands. By hoisting on the rope the patient is lifted from the floor to the desired extent. The toes should always be allowed to rest upon the floor. The plaster-of-

Paris bandages are then placed in water and allowed to remain until thoroughly wet through; they are then gently squeezed out, to rid them of excess of water, and are applied to the body, from just above the trochanters of the femur to the lower borders of the axillary folds. As the bandage is carried around the trunk, an assistant rubs and smooths every layer with his wet fingers. The turns are applied with no more pressure than is sufficient to make them lie smoothly. In children, five or six bandages are generally required. The dressing is completed by taking some powdered plaster-of-Paris, mixing it with water until a thick paste is formed, and thickly smearing the latter over the entire dressing until a perfectly smooth, uniform surface is formed. If possible, the patient should remain suspended till the bandage becomes well set. This requires ten to fifteen minutes; if this is too fatiguing, the patient should be laid upon his back, two assistants supporting him upon either side and preventing him from bending his body. After the bandage is thoroughly hardened the "dinner pad" is removed.

Adhesive Plasters and Strapping.

What kinds of adhesive plasters are commonly used?

The adhesive plasters in common use are of three varieties—the resin plasters, isinglass plasters, and the rubber adhesive plasters.

The resin plaster, commonly called surgeon's adhesive plaster, is the one most commonly employed. It is slightly stimulating to the surface, adheres firmly, and causes but little irritation. The thin paper covering the plaster surface is taken off, and the plaster is cut in strips of proper width and length. The strips are heated by passing them through the flame of an alcohol lamp, or by holding the unplastered side against a hot vessel.

The rubber adhesive plaster requires no heat; it adheres even more closely than the resin plaster, but is liable to cause a certain amount of irritation. It must be kept in contact with the surface for some little time before it firmly adheres. In applying it care should be taken to shave off all hairs, as, otherwise, its removal is quite painful.

The isinglass plaster must be moistened before it will adhere. To

Describe strapping of the ribs.

Strips of resin plaster, two and a half inches wide, and long enough to reach from the sternum to the spine are employed for this dressing. These strips are applied parallel to the course of the ribs. The first strap is secured posteriorly and is carried around the side of the chest as close to the axillary folds as possible. The next strap overlaps this downward for two-thirds of its width ; the straps are thus applied until the injured side of the chest is covered in.

This dressing is employed for fractures of the ribs and for hemorrhage from the lung.

Describe the strapping of an ulcer.

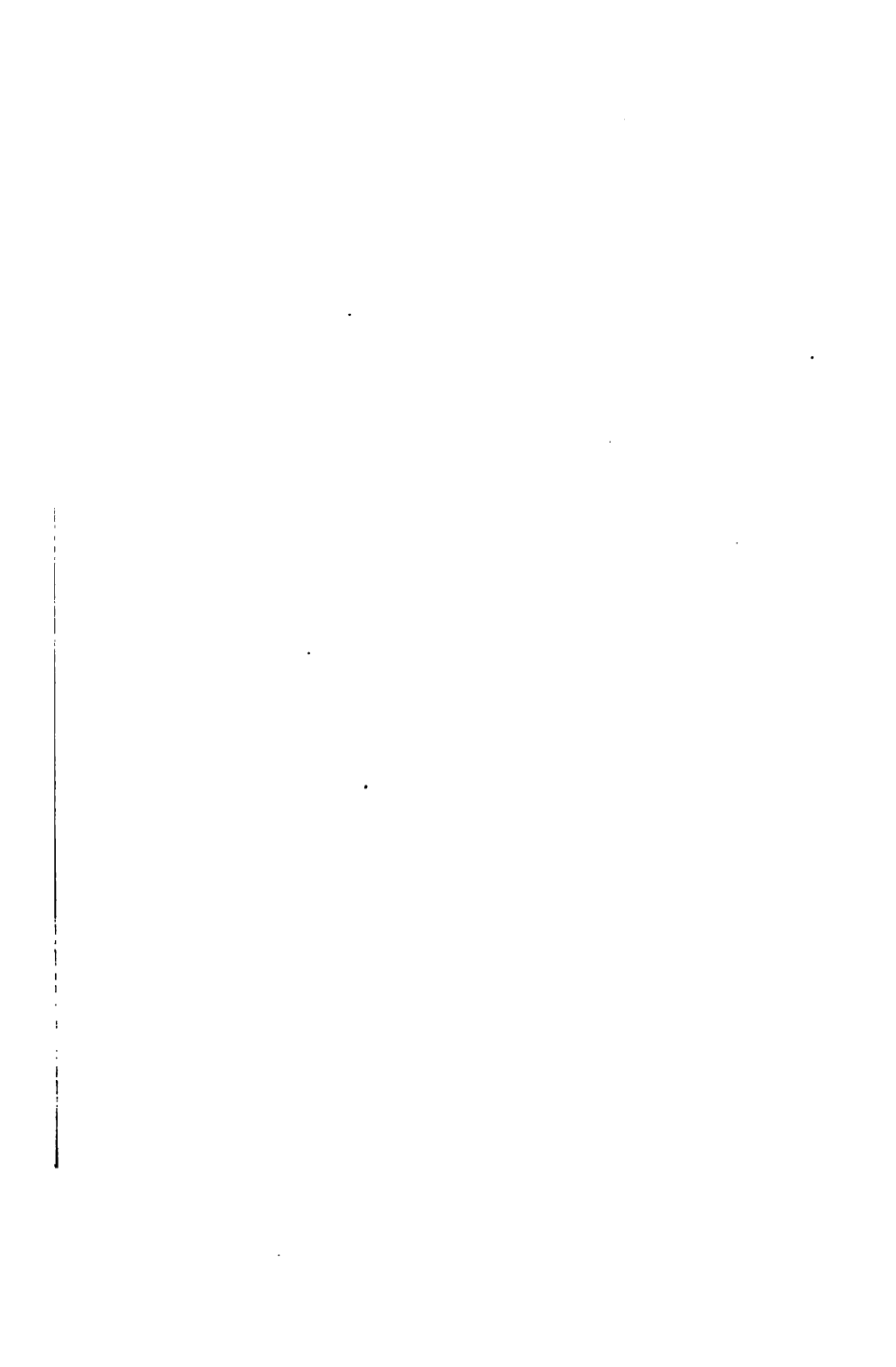
This dressing requires straps, each one inch wide, and long enough to pass two-thirds around the limb involved. First, the ulcer must be thoroughly cleansed, and the parts about it well dried. The straps are then applied, beginning two inches below the lower border of the ulcerated surface. The first strap is applied obliquely to the long axis of the limb, with its middle directly below the middle of the ulcer. The next strap is applied at right angles to the first, the angle of crossing lying directly below the ulcer ; each succeeding strap is applied overlapping upward for two-thirds of the width of the straps, until the ulcer is covered, and the dressing is continued two inches above its upper margin. When the ulcerated surface is reached the tissues of each side should be drawn together, the straps should then be secured to one side, drawn across and fastened to the opposite side, endeavoring thus to bring the tissues in closer approximation. Over this dressing a sheet of lint, or a thin, even pad of absorbent cotton is laid, and the dressing is completed by a tight spiral reversed or figure-of-eight bandage.

This dressing is peculiarly valuable in the treatment of chronic ulcers.

Knots and Sutures.**Describe the square knot.**

Either this or the surgeon's knot is the one commonly employed to secure bleeding vessels.

The square knot is formed by passing one end of a cord or ligature over and around the other end. This forms a single knot which is



drawn tight. The two ends are then carried toward each other and *the same end* is again carried over and around the other. On drawing this tight the square knot is formed.

The surgeon's knot is formed by carrying one end twice around its fellow; after tightening of this double turn, the same end is carried over its fellow again, and around, as in case of the square knot.

The surgeon's knot is harder to draw tight than the square knot, but there is less liability of the first turn slipping while the second securing turn is being formed.

Dressers are usually cautioned not to make what is called the granny knot. The difference between this and the square knot lies in the fact that one end having been carried across and around its fellow, the knot is completed by carrying this same end under and

FIG. 38.



Square Knot.

then around its fellow, or what amounts to the same thing, carrying the end which was first crossed, over and around the end which originally crossed it. In reality this forms a secure and reliable knot, and the objections to it are probably purely theoretical.

The square knot and surgeon's knot are commonly employed in securing ligatures and in tying sutures.

Of what materials are sutures generally made?

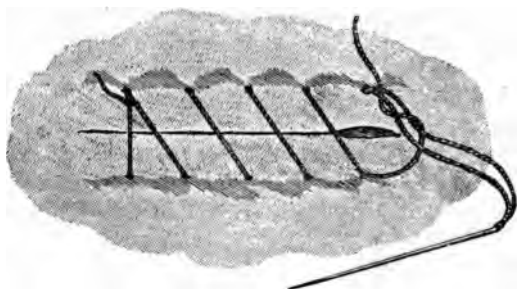
Sutures are usually made of silk, silver wire, catgut, silkworm gut, or horsehair. Of these, the catgut alone is absorbable; the others must be removed after application.

Describe the continuous suture.

(1) This is also called the glover's suture. The needle is passed

in one side of the wound, is brought out the other, and the knot is tied; the thread is then carried directly across the wound, the needle is again plunged in the same side as in the first place, is

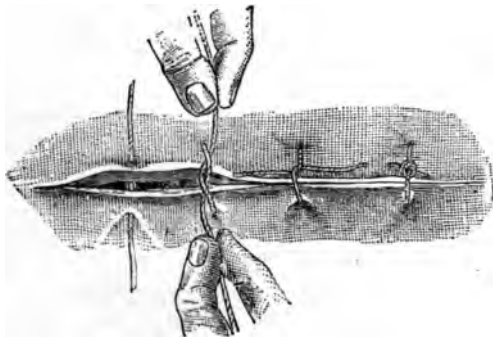
FIG. 39.



The Continuous, or Glovers' Suture.

carried in to the depth of the wound, is brought out at the opposite side and the thread is drawn tight. This practice is repeated until the wound is completely closed; the short end of the

FIG. 40.



The Interrupted Suture.

thread is drawn sufficiently through the eye of the needle to allow it to project from the side of entrance when the last stitch is formed; to this single thread the double thread is tied. This forms



a continuous over-hand suture, and is applicable to superficial wounds.

Describe the interrupted suture.

The interrupted suture is formed by entering the needle at one side of the wound, carrying it down to the deepest part and bringing it out on the opposite side; the suture is then tied with either the surgeon's or the square knot, and is cut. Each stitch is made separately, as many being placed as are required to close the wound. In this suture the stitches are in no way connected, so that were one to break the others would still continue to hold.

What other sutures are commonly employed?

THE PLATE SUTURE.—The end of the suture is secured in a broad leaden button or plate; the needle is then plunged in at one side of

FIG. 41.



The Plate Suture.

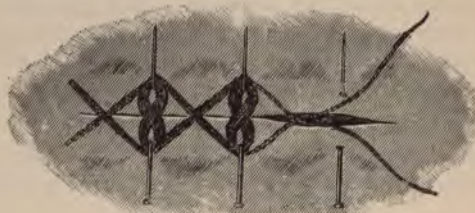
the wound to its deepest part, is brought out at the opposite side and is secured to another plate or button. This suture is valuable where there is much tension, since it gives a broad surface for the application of pressure.

THE PIN SUTURE.—A harelip pin is entered at one side of the wound, carried directly across its deepest part and brought out through the skin of the opposite side. Around the head and point of this pin is then carried a thread in the form of a figure of 8, approximating the lips of the wound and making sufficient pressure to check hemorrhage from vessels even as large as the coronary artery.

This form of suture is of value when it is desired to produce close approximation, and at the same time check bleeding.

THE QUILL SUTURE.—Two quills are cut, each the length of the wound. Each needle carries a double thread knotted at its end. The needle is entered at one side of the wound, some little distance from its edge, is carried across the depth of the wound and brought out at the other side. Through the loops formed by the knotting

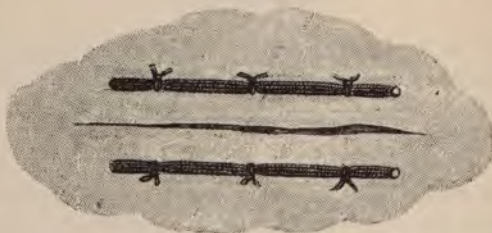
FIG. 42.



The Pin Suture.

of the doubled suture is passed a quill. These threads are then drawn tight, the needles are cut away, and the two ends of each thread are tied around a quill, placed on the other side of the wound, parallel to its long axis. This is applied for precisely the same purpose as is the plate or button suture; great tension is

FIG. 43.



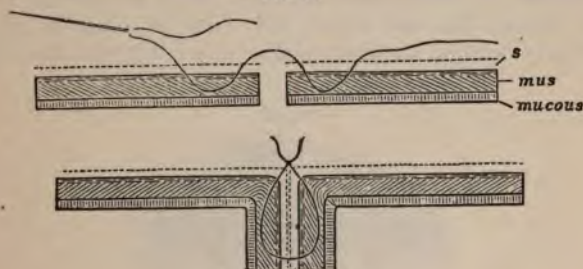
The Quill Suture.

allowable, since it is distributed over a large surface, and thus wounds are drawn in close apposition.

THE LEMBERT SUTURE.—This suture includes only the serous, muscular and submucous coats of the bowel. The needle is entered

at one side of the wound and caused to penetrate directly through the wall of the bowel until the sense of increased resistance caused by the tough submucous connective tissue is felt ; it is then pushed along at right angles to the long axis of the wound, and its point is made to emerge on the same side of the wound as it originally entered, the thread including about a fifth of an inch of the outer coats of the gut. The thread is then carried directly across the wound, the needle is thrust from without inward down to the submucous coat of the bowel, then brought out again, including the outer coats as before, and the suture is tied. This thread may be interrupted or continuous. In either case the stitches are placed from an eighth to a tenth of an inch apart. When the thread is

FIG. 44.



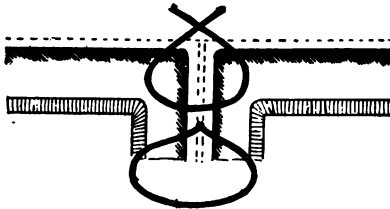
The Lembert Suture.

drawn tight the two serous surfaces are approximated. Fine catgut or China silk should be employed for this suture. The needle should be small, sharp, and with a perfectly rounded point, having no cutting edges. The ordinary milliner's needle answers well.

THE CZERNY SUTURE differs from the Lembert in the fact that the edges of the wound are brought together directly by carrying the needle through the serous membrane, out at the wound surface without penetrating the mucous membrane, in at the wound surface of the opposite side superficial to the mucous membrane, and out through the serous membrane. By these sutures the lips of the wound are approximated ; further security against leakage is insured by a row of Lembert's sutures, turning in the wound and thus

securing apposition of serous surfaces. This is termed the Czerny-Lembert suture.

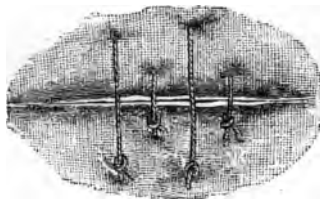
FIG. 45.



The Czerny Suture.

SUTURES OF RELAXATION are those which are brought out at some distance from the wound, and which are employed for the purpose of bringing the parts together where otherwise there would

FIG. 46.



Sutures of Approximation and Coaptation.

be dangerous tension upon the stitches which close the skin wound. For this purpose quill sutures or plate sutures are commonly employed.

SUTURES OF APPROXIMATION are those which are carried deep, and are designed to approximate the subcutaneous parts of the wound.

SUTURES OF COAPTATION are those which puncture only the skin. They should be applied so accurately that they practically hermetically seal the wound.

When should sutures be removed ?

This depends upon the amount of tension exerted upon them. They should not be allowed to remain longer than 8 to 10 days, as a rule. Sutures about the face should be taken out in one day in cases of ordinary wounds ; about the trunk or extremities in from 3 to 5 days. After laparotomy or where newly-formed tissues will probably be subject to great strain, it is customary to leave the sutures for from 8 to 12 days.

How are sutures removed ?

The knot is seized with a pair of fine dressing forceps, slight tension is exerted upon it, and by means of a pair of sharp-pointed scissors the thread on one side of the wound is divided ; the scissors are then placed flat upon the surface close to the point of exit of the divided thread, and the latter is drawn out by means of the forceps. Where silver wire has been employed, after cutting the suture the wire should be straightened out as much as possible before drawing it from the wound.

Catgut if properly prepared will be absorbed in a few days. The knots only will have to be taken from the surface.

What is meant by secondary suture ?

Under certain circumstances, as for instance, when a cavity has been opened, and the surgeon is not certain that suppuration may not follow, the sutures are inserted as usual but are not drawn tight, the wound is packed with iodoform or other antiseptic gauze and the dressing is applied. After a few days the gauze packing is removed and if the condition of the wound is satisfactory the sutures are knotted.

ANTISEPTICS.**What chemicals are required in antiseptic surgery ?**

The chemicals usually employed are bichloride of mercury, carbolic acid, iodoform, and alcohol. In addition, creolin, sulphate of zinc, boric acid, and peroxide of hydrogen are of value.

How is bichloride of mercury used ?

It is used in watery solutions varying in strength from 1-500 to

1-2000. The strength of 1-500 is used solely as a means of cleansing external parts. In the strength of 1-2000 it is used for irrigating.

Where large cavities are to be washed out the strength should not exceed 1-5000. The irrigating solution is made still more efficient by the addition of tartaric acid. This prevents the neutralization of the mercury by albumin. If it is desired to keep solutions of mercury for any length of time ordinary salt should be added, as otherwise the chloride of mercury is precipitated in the form of an oxide. (See Appendix for Formulæ.)

Mercuric solutions are also useful for the purpose of sterilizing dressings and rendering them antiseptic.

An alcohol solution of mercury, 1-1000, is employed for the preservation of silk ligatures.

What symptoms denote poisoning from absorption of bi-chloride solution?

There is at first a feeling of giddiness and faintness, and the patient is very restless. This may be followed by vomiting, foetid breath, salivation, and inflammation and ulceration of the gums and mucous membrane of the mouth. In severe cases there is often diarrhœa, the stools being blood-stained, and bleeding from the mouth and nose. Albumin and mercury are found in the urine.

To avoid toxic absorption the dressings must be wrung out as dry as possible. Very great care must be employed in children and in cachectic patients; and in irrigating the uterine or any large cavity even the most dilute solutions should not be employed.

How is carbolic acid used?

It is employed in the strength of 1-20 and 1-40. The 1-20 solution is used for the sterilization of instruments and for the cleansing of surfaces. The 1-40 solution may be used for irrigation, and the washing of sponges during an operation. The 1-20 solution benumbs and cracks the hands of the operator, hence, immediately before operating, this liquid, in which the instruments have been lying for half an hour, must be diluted by the addition of an equal volume of water, making the lotion of a strength of 1-40. On account of its volatility, the 1-20 solution may be used for the sterilization of dressings which are placed in contact with the wound. The heat

of the body very quickly causes evaporation of all the carbolic acid, leaving simply a sterile, non-irritating surface.

What symptoms denote poisoning from absorption of carbolic solution?

The urine becomes olive-green; the intensity of the coloration, however, is not indicative of the severity of the poisoning. The patient complains of headache, giddiness, anorexia and vomiting. In severe cases the symptoms are followed or accompanied by hæmoglobinuria and bloody diarrhœa, death following from collapse. Czerny describes a chronic form of poisoning termed carbolic marasmus, and characterized by headache, weakness, anorexia and an irritative cough.

Describe the uses of iodoform.

Iodoform must first be sterilized by a thorough washing in 1-2000 bichloride solution. It is then kept in boxes which are tightly closed. It is employed in the preparation of antiseptic gauze, and in the preparation of injection oils for the treatment of tubercular abscesses (iodoform one part, olive oil ten parts); it makes with collodion a dressing for superficial wounds; it is used as a dusting powder to the surface of wounds, and as an application to infected and suppurating wounds.

What symptoms denote poisoning by iodoform?

This drug exerts its toxic action chiefly on the heart and brain; usually the heart first shows the effect of an overdose, the pulse becoming more frequent and irregular. The patient complains of great debility, sleeplessness and headache, and suffers from extreme mental depression.

In more severe cases, in addition to the above symptoms, uncontrollable restlessness develops into delirium, hallucinations, or any of the various forms of acute insanity. These symptoms may last for weeks, and not infrequently end in death, from cardiac or pulmonary depression.

In the most fatal cases, the symptoms of acute meningo-encephalitis are followed by coma, involuntary passage of urine and fæces, and other signs of brain palsy; here a fatal termination is the rule.

Describe the uses of creolin.

Creolin may be employed precisely as is carbolic acid. It is devoid of the toxic properties of the former and does not produce irritation of the skin. It forms with water a mixture rather than a solution; the opacity of this latter is an objection to its use as a sterilizer of instruments. In the strength of 3 to 5 per cent. it is an efficient germicide; it is commonly used much weaker, but bacteriological investigations have shown that this is not safe.

Describe the use of boric acid.

Though not possessing great power as an antiseptic, solutions of this acid are of great utility from the fact of its being non-toxic. Saturated solutions are commonly employed (1 to 30 per cent.). In disinfecting mucous membranes or large absorbing cavities boric acid is found serviceable.

Describe the uses of chloride of zinc.

Chloride of zinc is commonly used in the strength of 40 grs. to the ounce. In this strength it is a powerful antiseptic. It is employed upon raw surfaces known to be infected or where infection is feared.

Describe the use of peroxide of hydrogen.

Peroxide of hydrogen is employed in the sterilization of suppurating cavities. It comes in what is called the 15-volume solution, and may be used in dilutions of from 10 per cent. upward, or in full strength. It is said to immediately destroy the pus microbes. To granulating surfaces it is best applied in the form of a spray.

Sponges.

How are sponges prepared for operation?

Sponges may be prepared by being thoroughly washed in hot water, dried, and well beaten until they are freed from sand. Calcareous particles may be further removed by steeping them in a 10 per cent. solution of hydrochloric acid. After thorough washing in pure water, they can be stored in 1-20 carbolic acid solution. A much more thorough way of preparing sponges is by beating out the sand, subsequently washing them in lukewarm water, then

steeping them for twelve hours in a mixture of one part of solution of chlorinate of soda to five parts of water. They are then well rinsed and dried. They may be kept either dry in tightly closed jars, or in 1-20 carbolic solution.

It is not advisable to use sponges more than once. Where this is necessary, however, they are best cleansed by being steeped in a concentrated solution of washing soda, well washed in clear water, and immersed for an hour in 1-500 sublimate solution.

Catgut.

How is catgut prepared?

The bundles of catgut which come in commerce are freed from their bindings, and are completely immersed in oil of juniper berries for one week, when they are removed and placed in absolute alcohol, and are kept indefinitely in this material.

The chromic catgut is made by tanning this material with chromic acid. A 1-20 solution of carbolic acid is prepared, and enough chromic acid is added to make a solution of 1-5000 of the latter drug. The catgut is immersed in this solution for four to six hours, or until the gut, when lifted out, is of the same amber color as the acid. It is then dried and packed in air-tight flasks. When used it should be soaked for half an hour in 1-20 carbolic or 1-1000 sublimate solution.

Silk.

How is silk sterilized?

Silk is sterilized by boiling for half an hour. It is subsequently stored in either 1-20 carbolic solution, or in absolute alcohol, to which may be added sufficient mercury to make a 1-1000 solution.

Dressings.

What dressings are usually employed in antiseptic surgery?

Bichloride Gauze.—This is prepared by boiling ordinary cheese cloth for two hours in water made moderately alkaline with washing soda. The grease is thus removed and the fabric is rendered absorbent. The soda is then washed out and the cheese cloth is again

boiled in pure water for two hours, after which it is wrung out, and is stored in sublimate solution, 1-500. When the dressing is to be applied, the 1-500 mercuric solution is wrung out, the fabric is dipped in 1-3000 solution, is again wrung out as dry as possible, and is then placed on the wound.

After the second boiling the cheese cloth may be dried in the sun and stored in air-tight jars or boxes. When used it can be dipped first into 1-500 solution, afterward into the weaker lotion of 1-3000.

Iodoform Gauze.—This is most readily prepared precisely as the bichloride gauze, except that after the cheese cloth has been thoroughly wrung out in 1-3000 corrosive sublimate solution it is sprinkled liberally with iodoform, and the latter is rubbed thoroughly into its meshes. The layers which lie in immediate contact with the wound may be wrung out in a 1-20 carbolic solution. The more superficial layers are dipped in a 1-3000 bichloride solution, and are then dried as far as possible by squeezing before they are applied. Bichloride cotton forms the outer layer of the dressing.

Protective.—Any smooth, readily sterilizable surface will answer for this part of the dressing. Lister's protective, gutta-percha tissue, oiled silk, or even waxed paper, may be used. The purpose of the protective is to prevent the wound from being irritated either by the antiseptics employed in the gauze, or by the irregular structure of the latter. A small piece is taken, just large enough to cover the wound, and is dipped into 1-20 carbolic solution. The latter evaporates shortly, and leaves a sterile surface in contact with the wound. Many surgeons dispense with the protective entirely.

Cotton.—Bichloride, borated, salicylated or plain absorbent cotton may be used. The bichloride cotton is the best.

Bandages.—These are commonly made of gauze, and conform in size to the regular roller bandage. The first roller applied should be wrung out of a 1-3000 bichloride solution.

Pins.—Either the ordinary pins or safety-pins are employed. They should be disinfected by means of carbolic lotion 1-20, and should be kept in absolute alcohol.

Describe Lister's new antiseptic dressing.

Gauze prepared as above is impregnated with a mixture of the cyanide of zinc and mercury and hæmatoxylin. This gauze is either

freshly prepared by diffusing the powder in a 1-3000 bichloride solution, incorporating it with the gauze, wringing out the latter, and applying it directly, or is stored damp in air-tight jars, to be used as required. The first layers applied directly over the wound are wrung out in 1-20 carbolic lotion; the more superficial part of the gauze dressing is rendered still more antiseptic by saturation in 1-3000 bichloride solution. Over the gauze is placed a thick layer of bichloride cotton.

Drainage.

By what means are wounds drained?

Either by drainage-tubes of rubber, bone or glass, or by catgut or horse-hair drains. The most efficient way to drain a wound is to leave it open and pack it with iodoform gauze.

When it is possible the drainage-tube, abundantly provided with fenestra cut in its sides, should pass through the wound from side to side, so that it may be readily washed out in case it becomes blocked, or may be cleaned, if necessary, by means of a soft catheter. Where deep cavities are to be drained, the tube should be carried to that part where accumulation of fluid is most liable to take place. The bone drainage-tube is used when the surgeon does not intend to remove his dressing till the wound is healed. In comparatively small wounds catgut or horse-hair may be employed. The former is absorbable, and should be used when it is intended that the wound shall heal under the first dressing; the latter has to be removed. Drainage-tubes are removed as soon as they cease to carry off discharge. This is commonly in the first thirty-six hours.

When may drainage be omitted?

In incised wounds, when there is no reason to fear that infection has occurred. Wounds as large as those resulting from excision of the breast, if aseptic, require no drainage.

Antiseptic Operations.

Describe the preparations for an antiseptic operation.

The surface about the seat of operation must be shaved and well washed with hot soapsuds, employing a clean flesh brush vigorously. This is followed by a thorough washing with either alcohol or ether,

which removes the fat from the surface of the skin and from the follicles, and enables the antiseptic solution to act upon any germs which may be present. The next washing consists in a careful cleansing with 1-500 solution of bichloride of mercury. The surface should finally be completely covered with a bichloride towel soaked in a solution of 1-1000. The operators, assistants and nurses then prepare their arms and hands in the following manner: The sleeves are rolled up, the hands and arms are thoroughly scrubbed in soap and water, by means of a nail brush the nails are carefully cleaned, and the hands are again scrubbed in soap suds. Alcohol is then used as a wash for two minutes, and the preparation is completed by washing the hands for three minutes in a solution of bichloride of mercury 1-1000. After this final washing, the hands must touch nothing which has not previously been sterilized; and, during the course of the operation, the surgeon and the assistants must occasionally wash their hands in a 1-1000 solution. When everything is prepared for the operation, the table, the surface of the patient's body, and the clothing, are all covered, first, by rubber cloth or mackintosh, then, over this, are spread bichloride towels, soaked in 1-1000 solution, so that the surgeon shall not inadvertently touch non-sterilized surfaces, or place dressings or instruments upon them. In the meantime the dressings are cut of proper size, wrung out in the proper solutions, and wrapped in bichloride towels.

Describe an antiseptic operation.

The instruments having previously been soaked in a solution of 1-20 carbolic acid, at the moment the operator is about to begin his work sufficient hot water is poured into the tray containing them to make a solution of the strength of 1-40. The instruments immediately required are then selected and placed on one of the bichloride towels in the neighborhood of the proposed operation. A basin containing sponges, thoroughly wrung out in bichloride 1-2000, is placed within reach of the assistant. A nurse stands with an empty basin ready to receive the blood-soaked sponges, which are immediately wrung out again in 1-2000 solution and placed convenient to the hand of the assistant. Every effort is made to keep the wound exposed as little as possible. During any intervals of operation the assistant must instantly cover the entire wound by sponges

or by a wet bichloride towel. When the upper portion of the wound is the seat of immediate operation the lower portion must be kept covered, and vice versa. Bleeding points are seized in artery forceps or hæmostats, and secured by catgut ligatures. On the completion of the operation, bleeding having been entirely checked, the wound is approximated. The edges are brought together with the most scrupulous accuracy, drainage having been employed or omitted, according to the will of the surgeon.

Describe an antiseptic dressing.

The wound having been carefully approximated, iodoform is dusted upon its outer surface, and a piece of protective, waxed paper, or other perfectly smooth substance, is dipped into a solution of 1-20 carbolic acid, cut so that the ends of the drainage tubes may project through it, and placed directly over the line of suture. This protective must be just large enough to cover the wound, and no larger. Over the protective is placed the deep dressing. This consists of eight or ten layers of gauze wrung out in bichloride solution 1-3000; or, iodoform gauze may be employed, when irritation of the skin is feared. The superficial dressing then follows, being composed of eight or ten layers of dry gauze prepared with bichloride. Over and around this is laid bichloride or absorbent cotton, and finally a bandage. Each application must be overlapped throughout its whole extent by the next superficial dressing.

ANÆSTHETICS.

How is anæsthesia produced?

General anæsthesia is produced by the administration of nitrous oxide, ether or chloroform.

Local anæsthesia is produced by freezing, or by the injection or application of cocaine.

Which is the safest anæsthetic?

Nitrous oxide for operations requiring, at the most, not more than two minutes. Ether comes next in order, and should be used, even in brief operations, when muscular relaxation is necessary.

What is the objection to the use of chloroform ?

Sudden death frequently occurs from cardiac or respiratory arrest, and without premonitory symptoms. This is liable to happen when the patient inhales while in a sitting position, as in the extraction of teeth; or when operations are begun in particularly sensitive regions, as the anus or vagina, before anæsthesia is complete.

How is nitrous oxide administered ?

In preparing the patient, the bladder is emptied of its contents, the clothing about the neck is unbuttoned, and false teeth or other loose bodies are removed from the mouth.

For the proper administration of this gas a receiver or cylinder attached to a gas-bag, and a mouth-piece provided with a double valve, which prevents the expired air from passing back to the bag, should be provided. The patient should be instructed to take deep, full breaths. In from thirty to sixty seconds, the dusky, congested face, the muscular twitching, and the stertorous breathing denote that the patient is fully under the influence of the gas.

How is a patient prepared for the administration of ether or chloroform ?

A careful examination of the urine should be made, and the condition of the lungs, heart, and vascular system should be determined by auscultation, palpation, and an examination into the clinical history of the case. For at least six hours before the anæsthetic is administered, no food should be taken into the stomach. Anæmic and excessively nervous patients should receive two ounces of whiskey half an hour before being anæsthetized. In drunkards a quarter of a grain of morphia renders the system much more susceptible to the action of the ether or chloroform. Immediately before inhalation is begun, the clothing is loosened about the neck, chest, and abdomen, and artificial teeth or other foreign bodies are removed from the mouth.

The physician should refuse to anæsthetize women, unless there is a third person in the room. Lights, if near, should be held above the level of the ether.

How is ether administered ?

A towel may be folded in a cone, or simply laid over the mouth and nose, and gathered in at the sides, so that the air is breathed



in through its meshes, and not by way of the space between its borders and the cheeks. Of the many inhalers, that of Allis is the best. It consists of a framework carrying many folds of an ordinary roller bandage. This gives a broad surface for the rapid evaporation of the ether. If possible the patient should lie flat upon his back. The eyes are protected by a folded towel placed over them. During the first few inhalations, the vapor should be very dilute, excepting in the case of screaming and terrorized children, when the ether should be pushed from the first. As soon as the patient becomes slightly intoxicated, the vapor should be as concentrated as possible.

Persistent coughing, swallowing, and attempts at vomiting, indicate that the reflexes are not abolished, and are best combated by pushing the ether. When the pulse is slow and full, the respirations deep and snoring, the reflex irritability totally abolished, and the patient completely relaxed, the anæsthesia is carried to the extreme limit of safety.

The respiration, the pulse, the pupil, and the color of the skin, must be carefully watched.

In what ways is the administration of ether complicated?

In the first stage the patient, though still partly conscious, may cease to breathe. This is called respiratory forgetfulness, and is best corrected by sudden pressure on the front of the chest, or by a dash of ether on the epigastrium.

In the second stage there is sometimes a tonic spasm, involving the respiratory muscles and accompanied by marked venous congestion. The ether should be withdrawn till this complication disappears. If the patient has eaten solid food within a few hours and vomits, he should be *rolled over on his side*; it is not sufficient to twist the head laterally.

In the third stage respiration may be seriously embarrassed by mucus collecting in the throat. This should be mopped out with small sponges firmly secured to holders. If there is laryngeal or pharyngeal obstruction, often denoted by a high-pitched, crowing sound on inspiratory effort, the lower jaw should be pushed forward and the head should be extended by upward pressure of the fingers placed beneath the ramus of the submaxillary bone.

Asphyxia sometimes threatens, from excess of ether, from drop-

ping back of the tongue, or from closure of the glottis. The surface becomes blue, the pulse frequent and irregular, and there is often laryngeal or crowing stertor, and absence of respiratory efforts.

Immediately the head must be extended and the lower jaw must be thrust forward. This acts upon the hyoid bone, elevates the epiglottis and opens the glottis. Artificial respiration is promptly instituted, the foot of the table being raised. Ether or ice water is dashed on the bared epigastrium, and the electric brush is applied intermittently, the sponge electrode being placed over the sternum or any indifferent part, while the wire points are touched to the epigastrium or other sensitive parts of the body during an inspiratory

FIG. 47.



Method of Pushing the Lower Jaw Forward, where there is Obstruction to Breathing.

effort. Finally, tracheotomy may be performed, when the lungs can be inflated directly.

A twentieth of a grain of strychnia should be given hypodermically as soon as dangerous symptoms appear; this may be repeated once if the subsequent course of the case makes it necessary. Alcohol and ammonia seem to be of no service, while ether injected hypodermically is obviously not to be commended.

What symptoms denote that the patient should have more air?

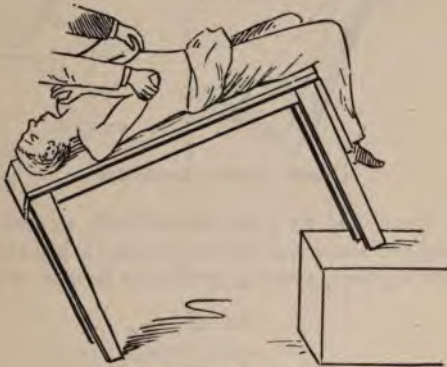
A feeble, infrequent pulse. Lividity of the surface. Laryngeal stertor. Pallor and tonic spasm. A pupil suddenly becoming widely dilated (a sign of imminent death). Reversal of the normal respiratory movements of the belly, denoting diaphragmatic palsy.

How is artificial respiration performed when dangerous symptoms develop during anæsthesia?

The table is tilted up till it makes an angle of 45° with the horizon, the head being low.

The head is extended so that it rests near the crown upon the surface of the table, the eyes looking upward and somewhat backward. At the same time the under jaw is pushed well forward by pressure applied behind the rami. In the absence of assistants, the drawing forward of the hyoid bone and consequent opening of the glottis may be accomplished by letting the head hang over the end

FIG. 48.

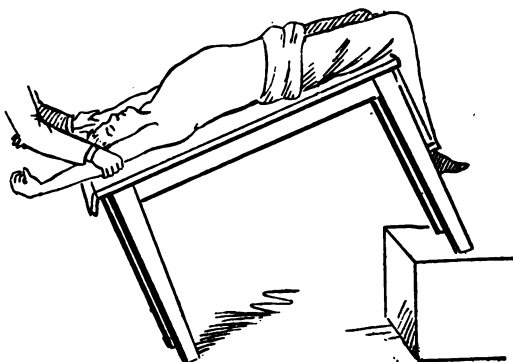


Sylvester's Method—Expiration.

of the table. The surgeon, standing at the head of the patient, then seizes him by the arms just above the elbow joints, carries the arms partly across the chest toward each other, and throws his weight downward so that the lungs are emptied of the anæsthetic vapor which may remain in them. The arms are swept in a semi-circle *directly out from the sides* and upward till they extend above the head. Firm traction is made for two seconds to further fill the chest with air. The arms are then carried down to the chest wall again, where by pressure the lungs are made to expel the inspired air. These motions are repeated from twelve to sixteen times a minute, and practically constitute the Sylvester method of artificial

respiration. Howard's method, which is exceedingly efficient, is as follows: "Make the head hang back as low as possible. Place the patient's hands above his head. Kneel with the patient's hips be-

FIG. 49.



Sylvester's Method—Inspiration.

tween your knees, and fix your elbows firmly against your hips. Now, grasping the lower part of the patient's naked chest, squeeze his two sides together, pressing *gradually* forward with all your

FIG. 50.



Howard's Method—Expiration.

weight for about three seconds, until your mouth is nearly over the mouth of the patient, then, with a push, *suddenly* jerk yourself back. Rest about three seconds, then begin again, repeating these



bellows-blowing movements with perfect regularity for at least one hour, or until the patient breathes naturally."

Under what circumstances is chloroform preferred to ether?

Where there is emphysema of the lungs or bronchitis, particularly in the aged or the very young. Where there is vascular degeneration, or disease of the kidneys. Where operations about the mouth, which may require the application of the actual cautery, are performed. Where it is necessary to give an anæsthetic to an infant.

How is chloroform administered?

The patient is prepared as for the administration of ether. Not more than a drachm of chloroform is poured upon a towel, and the latter is held close to the mouth, but not touching it, otherwise painful blistering may occur. During the first few inhalations sufficient air is allowed to avoid giving the patient a sense of suffocation. Deep, full breaths should be taken, children being directed to blow out. Absence of reflexes, particularly that elicited by touching the conjunctiva, and complete muscular relaxation, denote that the patient is completely anæsthetized. Then, *and not till then*, should the operation begin. The pupils during full anæsthesia are commonly contracted.

Death occurs from respiratory arrest, though cardiac syncope, with a fatal issue, is common. The complications and their treatment are the same as in ether. Prolonged administration seems to have been followed occasionally by fatty degeneration of the heart muscle.

Under what circumstances is the administration of chloroform especially dangerous?

In timid, anæmic, violently hysterical patients, and in those exhibiting the signs of a feeble or fatty heart, as denoted by weak irregular pulse and sluggish peripheral circulation. In angina pectoris this anæsthetic should not be given, and a singularly high mortality has attended its employment in operations about the anus.

How is cocaine employed for the production of local anæsthesia?

Mucous membranes are anæsthetized by the application of solutions varying in strength from 4 to 10 per cent. The surface to be

anæsthetized should first be cleansed by a boric acid wash or spray ; the cocaine is then applied, and in three minutes the application is repeated. In two more minutes the part will be found to be non-sensitive. The urethra is anæsthetized by injecting a 4 to 10 per cent. solution and allowing it to remain for three minutes ; not more than two grains should be injected.

When minor operations are to be performed, such as the amputation of a finger, circumcision, or the removal of small tumors, a 2 to 4 per cent. solution is injected into the deeper layers of the skin along the line of incision. If practicable, a rubber band is placed around the field of operation, so that the circulation is entirely interrupted. This prolongs the local anæsthesia and prevents rapid absorption into the general blood current. The injections must be carried as deep as the cutting. When the patient complains of pain, one or two more drops may be injected into the sensitive part.

To avoid many punctures, the needle is entered to its entire length, and one or two drops of the cocaine solution are injected ; it is then withdrawn a quarter of an inch and a couple of drops again injected : this is repeated till the point of the needle is no longer deep enough to carry the injection into or below the skin, when it is entered at another portion of the proposed incision and the cocaine injected as before. The total quantity of the drug injected should not exceed $1\frac{1}{2}$ grains.

How is cold employed for the production of local anæsthesia ?

The simplest way to produce local anæsthesia by cold is by means of a piece of ice and some salt. The salt is liberally sprinkled over a corner of the ice, and the latter is clapped to the surface of the skin ; in less than two minutes the skin will be found white, hard and frozen, and may be incised without giving pain.

By means of a spray of rhigolene, the freezing is much more quickly accomplished, is less painful, and is more superficial. The spray may be applied by means of an ordinary nasal spray apparatus. In thirty seconds the part is usually non-sensitive and frozen.

Counter-Irritants.

Under what circumstances are counter-irritants employed?

- (1) As general stimulants in conditions of acute collapse.
- (2) As local revulsants in cases of inflammation or congestion.

What materials are commonly employed as rubefacients?

Rubefacients include such remedies as produce a congestion of the skin without resulting structural change.

This may be accomplished by heat, either moist or dry, by heat alternating with cold, by turpentine, by mustard, by stimulating lotions such as chloroform liniment, by capsicum.

How are rubefacients applied for their constitutional effect?

They are applied to the nape of the neck, to the wrists, to the abdomen, to the inner surface of the thighs and to the calves.

How are hot fomentations applied?

Two thick flannel cloths doubled several times, and a vessel of water kept constantly at a temperature of about 120, must be provided. Both cloths are thrown into the hot water. One is removed, wrung out, and applied to the surface of the body; it is at once covered with waxed paper or other protective, preventing rapid cooling; in a few minutes the second cloth is wrung out and replaces the first, which is again soaked in the hot water. This is continued for several hours. It is not always necessary to change the cloths so frequently, but where active inflammation is to be combated, good effects will be obtained only by constantly maintaining a high temperature.

After the fomentations have ceased the part should be protected by cotton or flannel. If the inflammation thus treated has involved any portion of the extremities, a pressure bandage should follow the application of heat and moisture.

How are turpentine stupes applied?

A thick flannel compress is wrung out in hot water, its folds are then opened and over its surface turpentine is liberally sprinkled; this is applied directly to the surface of the body. If waxed paper envelopes this dressing, care must be taken to see that the

turpentine does not act too violently, as severe blisters may be produced in the course of an hour. Where no protective is used the turpentine usually evaporates before sufficient time has elapsed to allow of vesication.

How is mustard employed as a rubefacient?

Mustard may be used as a dry powder sprinkled sparingly over the surface of flannel or other fabric worn in immediate contact with the skin. It may be added to a local or general bath, in the proportion of a tablespoonful to the gallon of water. It may be used in the form of a plaster. This may be purchased ready for immediate application, or may be made from ordinary kitchen mustard.

Where it is desired to leave the plaster in contact with the surface for upwards of five minutes, flour or other inert substance must be used to dilute the mustard. Usually two parts of white mustard and one part of flour are employed. These substances are thoroughly mixed, and to them is added enough tepid water to make a thick paste. This is spread in the middle of a clean cloth, the edges of which are folded in so that the mustard is prevented from extending beyond the desired limits. Over the surface of the plaster is spread one thickness of cheese-cloth or linen. The dressing is then applied to the surface of the body.

Where a quick effect is desired, white mustard may be used in full strength. Black mustard should be diluted one-half.

A very mild counter-irritant effect may be obtained by mixing with the ordinary flaxseed poultice a few teaspoonfuls of the mustard seed flour.

How is capsicum used as a rubefacient?

This may be employed in the form of capsine plaster, found in drug stores, or may be incorporated with ginger, cloves, cinnamon and honey, making the well-known spice plaster.

Describe the application of ammonia as a rubefacient.

This may be applied in the form of a liniment. Where very rapid action is desired, a piece of lint soaked in the stronger water of ammonia may be placed upon the surface of the body and covered with waxed paper or other impervious material. It must be borne in mind that in eight or ten minutes a blister can be raised by this last



method, hence the application should not be continued for more than two or three minutes at most.

For what purpose are vesicants employed?

Vesicants are applicable to the same conditions which are suitable for the employment of rubefacients. They are employed by preference when a more prolonged and powerful action is desired.

What materials are employed in producing vesication?

Cantharides, chloroform and ammonia.

How is cantharides employed as a vesicant?

Cantharides may be used in the form of the cerate, or as cantharidal collodion.

To apply it in the form of cerate, a piece of ordinary adhesive plaster an inch wider in all its dimensions than the size of the blister desired is prepared. Upon the central portion of this is spread a thin layer of the cerate. The plaster is slightly warmed and applied to the surface, when it maintains the blistering cerate in close apposition to the skin as long as necessary. Before applying this plaster the skin must be thoroughly washed with soap and water. In six hours the plaster is removed and replaced by a poultice. The poultice may be applied at the same time as the vesicant, directly over it.

The resulting blister should be cut with a pair of scissors at its most dependent portion, drained of its serum, and dressed with a sheet of lint spread with boric ointment.

If continued counter-irritation is desired, the skin raised by the blister may be entirely stripped off, and the raw surface may be dressed with savine ointment or other irritating applications. It is sometimes desirable to apply a large number of small blisters, and frequently repeat these applications rather than to produce an extensive vesication; this is particularly the case in chronic inflammations. This is conveniently accomplished either by the employment of cantharidal collodion, or by smearing pennies with a thin layer of cerate, and fastening them in place with adhesive strips or a roller bandage.

The cantharidal collodion is conveniently employed when the patient is refractory, or when the surgeon is not certain that his directions will be carried out. The surface to be blistered is prepared, if possible, by poulticing; where this is not practicable it

should be well washed with soap and water. The cantharidal colodion is then painted, for two or three minutes, in spots the size of the blister desired. The subsequent treatment is the same as when the cerate is used.

What precautions must be observed in the employment of cantharides?

Cantharidal blisters should involve only very small surfaces when applied to the skin of the old, the young, the feeble, or the cachectic.

Care must be taken to see that sufficient absorption does not take place to produce strangury. This complication is denoted by frequent, painful micturition, the urine commonly containing blood. It is avoided, in the first place, by using blisters of moderate size, by removing them in from four to six hours, especially where there is reason to suspect that such complication may occur from the existence of previous irritation of the bladder or kidneys, by incorporating with the cantharides one-fourth of its weight of camphor.

How is strangury treated?

Where this complication occurs it is best treated by opium and belladonna suppositories, by demulcent drinks, by warm sitz baths, and, if severe, by leeches, applied to the perineum and to the hypogastric region.

How are chloroform and ammonia employed as vesicants?

Chloroform and ammonia are rarely used except in cases of great urgency. A few drops of chloroform are thrown into a watch crystal; the latter, on being clapped to the surface of the body, rapidly produces a blister. The stronger water of ammonia may be used in the same way, or may be employed as described above under rubefacients, the application being continued for from 10 to 15 minutes.

The blisters produced by these agents are painful and severe, and are often exceedingly difficult to heal.

Describe the formation of an issue.

An issue is an ulcer intentionally formed by the use of the knife, by heat, or by caustics. Issues are rarely employed at present, though they were at one time popular as a means of causing long-continued counter-irritation and depletion. The ulcer is commonly

formed by caustic potash. Several thicknesses of adhesive plaster, through which a hole has been cut, are applied to the body. On placing the potash in this opening, the exposed skin is destroyed, while the surrounding surface is protected by the plaster. In two hours this application is removed, and the part is washed with a dilute acid, to prevent further cauterant action. When the slough separates, leaving a punched-out ulcer, the latter is prevented from healing by the presence of some foreign body, such as a small pebble or a bean. This ulcer may be dressed daily with a pledget of aseptic gauze, kept in place by adhesive plasters.

The Moxa is a small pledget of combustible material, such as punk, which burns slowly. This is placed upon the surface of the body and ignited. The resulting ulcer is treated as before. On account of the pain attendant upon thus forming an ulcer, this method is no longer employed. The objection to the employment of the knife in the formation of an issue is that the wound closes rapidly.

Describe the formation of a seton.

The seton is used for the same purpose as the issue. It is simply a subcutaneous sinus with two openings upon the surface.

It is formed by pinching up a fold of skin, thrusting directly through this doubling a scalpel, and carrying through the perforation thus made an eyed probe threaded with a skein of silk.

Each time the dressing is changed, the silk threads should be moved somewhat.

Describe the application of the actual cautery.

The actual cautery represents the most powerful means of revulsion and counter-irritation. It is not more painful than other less feared methods of counter-irritation.

Heated irons, or glass rods, or the Paquelin cautery tips are commonly employed. Before making the application a vessel of ice water, in which are soaking thick flannel cloths, should be provided. The cautery should be heated to a white heat and should be applied either to one spot, or, as is more commonly the case, should be drawn in streaks along the affected area.

Its application should be immediately followed by placing the cloths, wrung out in ice water, upon the burn.

If a single deep burn is desired the portion of the surface to be acted on may be frozen by ice and salt before the application of the cautery.

Where Paquelin's cautery is used, care must be taken lest in over-heating the tips the instrument is destroyed.

DEPLETION.

Describe the operation of blood-letting.

Blood is usually drawn from the median cephalic, the median basilic, or the external jugular vein. *The guide as to quantity is the pulse.*

The operator requires roller bandages, a small antiseptic dressing, and a lancet, together with one or two basins.

If the blood is to be drawn from the arm, the median cephalic vein should be preferred ; where this is too small, the median basilic may be the seat of operation. It must be remembered, however, that this vein is in close proximity to the brachial artery ; the latter should be protected by one finger of the operator when the vein is cut.

The patient's arm must be thoroughly cleansed by the antiseptic method ; it is then encircled at about the middle of the humerus by a few circular turns of the roller bandage, applied with sufficient firmness to block the venous circulation, but not to prevent influx of blood from the brachial artery. The patient is at the same time instructed to grasp as firmly as he can a roller bandage or other round object, the arm being held in a dependent position. After a few minutes the veins become very conspicuous. The surgeon thrusts the point of his lancet down beneath the vein and cuts quickly outwards, making a free skin opening. A careful watch is kept upon the pulse. When this becomes sufficiently soft and slow the encircling bandage is removed, the wound is washed with bichloride solution, an antiseptic compress is applied, and the limb is enveloped in a roller bandage from the fingers to the axilla.

In case of apoplexy or inflammations of the brain, it is desirable to bleed from the external jugular. By compressing this vessel with

the finger at the base of the neck it may be made sufficiently prominent. After the vein is divided and sufficient blood drawn, the dressing is applied and retained in place by a bandage carried around the neck.

The precautions to be observed in bloodletting are :—

- (1) To operate under all antiseptic precautions.
- (2) To wound no other important structure than the vein.
- (3) To make the skin incision so free that there is no danger of infiltration.

At times it is exceedingly difficult to find the veins. This is especially the case in very stout persons. Here a careful dissection may be made in the region where they are known to lie, or by means of a candle or bright light their position in the subcutaneous tissue can be determined by the shadows they cast.

Arteriotomy is sometimes practised in cases of acute inflammations, especially those involving the eye.

The anterior branch of the temporal artery is usually selected, as it is accessible and lies on a firm base, against which pressure can be applied for the control of bleeding after sufficient blood has been drawn.

The position of the vessel is determined by its pulsation.

The point of the lancet is then thrust down beneath the vessel; the latter is cut transversely entirely through. When the pulse is sufficiently modified, a firm bandage will readily control bleeding.

Cupping.

Describe cupping.

Cupping may be either dry or wet. A dry cup simply draws the blood to the surface. A wet cup abstracts blood from the body. In the performance of either of these methods of depletion, regular cupping glasses, with appliances for the creation of a vacuum, or simply ordinary glasses with a little alcohol, may be employed.

If the ordinary glasses are employed, they should be placed mouths downward upon a clean towel, and a candle or alcohol lamp should then be lighted. Into the first glass is poured one or two teaspoonfuls of alcohol; this is rinsed around and poured into a second glass.

The excess of alcohol in the first glass is then shaken out, the glass is pressed against the towel for a moment, to remove any drops which may have run down to its edges, and is then placed over the candle or alcohol lamp, when the thin film of fluid remaining is ignited. The glass is now instantly clapped to the surface. The contained air is immediately exhausted by the burning alcohol, a powerful vacuum is created, and the flame is extinguished even before a sense of warmth is appreciated by the patient.

PRECAUTIONS.—All excess of alcohol must be removed, so that there will be no drops running over the surface of the body when the glass is applied.

The mouth of the glass must be applied closely to the body, as otherwise air will enter and the alcohol still continue to burn.

These cups should not be allowed to remain in one place more than three minutes, as otherwise extensive vesication will be produced.

Describe wet cupping.

Wet cupping is performed in precisely the same manner as dry cupping, excepting that incisions or punctures are made before the application of the cups; the vacuum thus created encourages very free bleeding.

Leeching.

Describe leeching.

Two varieties of leeches are used, the American and the Swedish. The former draws about a teaspoonful of blood, the latter three to four teaspoonfuls. The Swedish leech is usually employed.

In the selection of leeches care should be taken that they come from clean, pure water. Those which are active and which have smooth, glazy skins are to be preferred.

The leech should never be used more than once.

Surfaces to which leeches are to be applied should be thoroughly washed and shaved, and if there is any difficulty about inducing the leeches to bite, the skin should be smeared with a little milk or blood.

The leeches are placed in a glass or a wide-mouthed jar, and the mouth of the latter is clapped to the surface of the body.



When the leeches have drawn sufficient blood they can be induced to let go by dropping salt or snuff upon them.

The bite can be dressed by a little pledget of iodoform gauze, together with a pressure bandage. If it still continues to bleed, a small pledget of styptic cotton may be employed, or, where hemorrhage is very obstinate, a hare-lip pin may pass through the centre of the bite, and the latter can be encircled by a tight ligature.

PRECAUTIONS.—The leech must not be placed over the arteries or nerves, or upon loose cellular tissue such as the eyelid or scrotum.

In the application of leeches about mucous cavities care must be taken to see that they do not escape into the interior of the body. This can be prevented by plugging the continuation of the cavity or by securing the leech.

Transfusion.

Describe transfusion.

Transfusion may be effected by either the immediate or direct method, which consists in carrying blood directly from the vessels of one person to those of another without exposure to air, or by the mediate or indirect method. In the latter the blood is drawn into a vessel and defibrinated, then injected into the vessels of the person requiring it.

In the direct method the injection is most readily accomplished by the Aveling apparatus. This is practically a delicately constructed Davidson syringe, provided at each extremity of the supply and injection tube with a canula and stop-cock. The syringe is first filled with normal saline solution (.7 per cent.); the median or basilic vein of the patient and of the blood-giver are then exposed. The two arms are placed side by side, and into the vein of the blood-giver the receiving canula is secured, with its extremity pointing toward the hand. The canula arming the extremity of the injection pipe is then thrust into the vein of the patient, its end pointing toward the heart. By pressing the bulb in which both of these tubes end, the saline solution is driven into the circulation of the patient. On releasing the bulb a valve shuts off the suction from the patient's blood, while another one allows that from the veins of the blood-giver to again fill the bulb. By alternately emptying and filling the

The seat of puncture should be dressed with iodoform collodion, or other easily applied antiseptic dressings.

The piston rod should be pressed down both while the needle is entering the subcutaneous tissues and while it is being withdrawn.

What portions of the body are selected for hypodermic medication?

Since the cellular tissue is usually selected as that best suited to receive the medication, and since the solutions used generally give more or less pain, the least sensitive portions of the body provided with a thick layer of superficial fascia are usually selected. It is commonly stated that absorption is more rapid from the inner surfaces of the arm and forearm. This is the popular region for injections; less pain will be experienced, however, when the needle is driven into the outer surfaces of the thighs or buttocks.

As a general rule, it may be stated that when morphia is injected for the purpose of controlling pain it should be inserted as near the seat of pain as possible.

How may pus formation be avoided in hypodermic medication?

By observing the principles of antiseptic surgery. In an ordinarily healthy body the most irritating medications may be injected without fear of abscesses, provided proper precautions in regard to the sterility of the solution, and the instrument by which it is injected are observed. Standard solutions should not be kept, but the drug indicated should be dissolved in boiled water immediately before it is employed.

How can the hypodermic syringe be kept aseptic?

After the needle has been used it should be boiled and subsequently kept in absolute alcohol. The syringe should be washed out in carbolic or in saturated boric acid solution, and should be provided with a cap which renders it air tight.

How do you administer hypodermic injections?

A sterile solution is drawn into the barrel of a sterile syringe; the needle is secured in place, and the piston is pressed up till all the air escapes.

The method of injection which gives least pain consists in quickly

plunging the needle to the depth required directly into the tissues, beginning the injection the moment its point has penetrated through the skin, and pressing the last drops from the barrel just before the point of the needle is again withdrawn. Where muscular injections are given, and these in all instances are less liable to give rise to local troubles, the needle may be thrust in to its full length. Where a more superficial injection is desired, the depth of insertion may be controlled by the thumb or finger placed upon the shaft of the needle and acting as a guard against too great penetration. When the point of the needle is kept well sharpened the sudden thrust gives almost no pain.

As ordinarily practised, the skin is pinched up in a fold between

FIG. 51.



Hypodermic Injection.

the thumb and forefinger of the left hand; into one end of this fold the needle is inserted obliquely, by either slowly forcing it through the tissues or by a sudden thrust. The injection is then driven out of the cylinder, the needle is withdrawn, and the puncture is closed by the application of iodoform collodion.

What accidents may occur in the administration of hypodermic medication?

(1) Should the needle point penetrate a large vein, the whole of the injection fluid may pass *immediately* into the general circulation and produce serious, or even fatal, consequences.

(2) Should the injection lie in the immediate neighborhood of a sensitive nerve, very great, and even lasting, pain may be produced.

When the diagnosis of fracture cannot positively be determined the injury should be treated as though it were a fracture, till subsidence of swelling enables the surgeon to determine the nature of the injury.

When the fracture is readily reduced, and when there is not great swelling, the plaster-of-Paris dressing may be employed. This should be carefully watched to see that with the onset of swelling it exerts no injurious pressure.

How are fractures of the lower jaw dressed ?

After careful reduction of deformity the fracture is dressed in a moulded pasteboard splint, or trough, which extends back laterally as far as the ramus, and beneath to the hyoid bone. This is well padded and kept in place by either a Barton or a Gibson bandage.

In this dressing the lower jaw is practically splinted upon the upper. Where the dental conformation is very irregular it may be necessary to insert between the teeth of the upper and those of the lower jaw a moulded arch before perfect apposition can be maintained.

In case this dressing is not successful the fragments should be drilled and wired together.

How are fractures of the clavicle dressed ?

Fractures of the clavicle may be dressed by means of the Velpeau or Désault bandage, or by Sayre's adhesive plaster dressing. The choice of dressings will depend upon the seat and nature of the fracture. In general it may be stated that the arm and shoulder should be bandaged in that position which secures most accurate apposition of the ends of the broken bone.

The Velpeau and Désault dressings have already been described.

The Sayre dressing consists of strips of adhesive plaster, three and a half inches wide. The first is long enough to surround the body, including the arm ; this strip encircles the arm over the insertion of the deltoid, in the form of a loosely fitting loop which must be made secure by sewing. The arm is drawn somewhat downward and backward in order to make the clavicular origin of the pectoralis major muscle tense. It is secured in this position by carrying the strip entirely around the body and fastening it to itself in the back. The second strip, beginning at the sound shoulder, is carried

bulb in this manner a sufficient quantity of blood is injected. The capacity of the bulb being known the total amount is readily calculated. It should not, however, be weighed by ounces, but by the effect upon the patient.

The indirect method consists in drawing the blood from the donor into an aseptic vessel, whipping it with broom straws to separate the fibrin, straining it through a fine linen cloth, and injecting it into the veins of the patient, preferably by means of a clean Davidson syringe provided with a canula.

The cardinal objection to these methods lies in the fact that human blood is no more efficacious as an injection into the veins than normal saline solution; that it is often difficult to find a healthy person willing to supply this blood, and that the technique requires considerable skill and care.

A much more efficacious means of supplying volume to the circulating fluid as a means of tiding over an emergency is afforded by injections of sterile normal saline solution (.7 per cent.). A vein of the patient is exposed and dissected from its attachments for an inch, and two ligatures of catgut are passed beneath it. The distal ligature is tied, an opening is made into the vein between the two ligatures, a canula is inserted into the vein lumen, and is secured in place by tying the proximal ligature. By means of a dropper this canula is then filled with normal saline solution, after which it is connected with a pipe attached to an irrigator containing one or two quarts of the same solution. The injection is continued till the pulse responds.

HYPODERMIC MEDICATION.

What precautions should be observed in administering hypodermic medication?

The syringe, its contents, and the seat of operation should be sterilized.

Large vessels and important nerves should be avoided.

When the solution is irritating or liable to give much pain it should be injected into the muscles.

The seat of puncture should be dressed with iodoform collodion, or other easily applied antiseptic dressings.

The piston rod should be pressed down both while the needle is entering the subcutaneous tissues and while it is being withdrawn.

What portions of the body are selected for hypodermic medication?

Since the cellular tissue is usually selected as that best suited to receive the medication, and since the solutions used generally give more or less pain, the least sensitive portions of the body provided with a thick layer of superficial fascia are usually selected. It is commonly stated that absorption is more rapid from the inner surfaces of the arm and forearm. This is the popular region for injections; less pain will be experienced, however, when the needle is driven into the outer surfaces of the thighs or buttocks.

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How do you administer hypodermic injections?

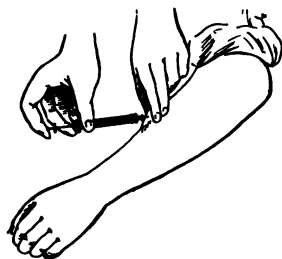
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(2) Should the injection lie in the immediate neighborhood of a sensitive nerve, very great, and even lasting, pain may be produced.

(3) Should the injection contain septic germs, abscesses will probably form.

Describe the method of administering large hypodermics.

Where much blood has been lost, so that the patient is in danger of death from emptiness of the vascular system, large hypodermic injections may be employed in place of forcing the liquid directly into the veins or arteries. For this purpose, a fine aspirating needle and an ordinary irrigating apparatus suffice.

An area of the body containing a thick layer of superficial fascia is selected. The aspirator is thrust into this, the trocar is withdrawn, a rubber tube leading from the irrigator is attached to the canula, and the solution is allowed to flow in by gravity, its absorption being promoted by gentle massage. In this way one or two quarts of saline solution may readily be injected.

FRACTURE-DRESSINGS.

What are the general principles governing the dressing of fractures?

The fracture should be reduced before the dressings are applied, the purpose of splints being merely to *retain* the parts in the position in which the surgeon has placed them.

All dressings should be inspected daily during the week following a fracture. In case of severe and lasting pain, swelling and œdema of parts peripheral to the injury, or loosening and displacement of the splints and bandages, the dressing must be reapplied.

After inflammatory symptoms have subsided, the seat of injury should be disturbed as little as possible. The dressings should be inspected frequently, but should not be taken down oftener than once a week, unless they become loose or uncomfortable.

Splints should be carefully padded to fit the surfaces to which they are to be applied. Bony prominences should be protected from undue pressure by cotton or oakum, twisted into a ring and placed around such prominences.

The splints should retain the fragments in their proper position and should fix both the joint above and the joint below the injury.

Fractures of both bones of the forearm require two straight splints, each of which should be broader than the portion of the limb to which it is applied. The anterior splint extends from the elbow to the tips of the fingers, the posterior from the elbow to the lower extremity of the metacarpal bones. These splints are carefully padded, the forearm is bent at a right angle to the arm, the fracture is reduced, and the splints are applied and kept in place by firm turns of the roller bandage. The forearm is then slung across

FIG. 58.



Dressing for Fractures of One or Both Bones of the Forearm.

the chest by means of a broad handkerchief, supporting it from the wrist to the elbow. In this dressing the hand should be placed between pronation and supination; that is, thumb up.

How are fractures of the radius dressed?

Fractures of the neck of the radius, or of the shaft just below the tubercle, are dressed by flexing the forearm on the arm, supinating the hand and dressing on an anterior angular splint, a compress

being applied to prevent forward projection of the bone. The splint may be moulded from pasteboard or felt.

Fractures of the middle third of the radius may be treated as directed in fractures of both bones, or by means of the anterior rectangular splint together with a straight posterior splint, the latter extending from the point of the olecranon to the metacarpo-phalangeal articulation.

Fractures of the lower extremity of the radius are treated by means of a Bond splint, the Levis splint, the Nélaton splint, or the two straight splints as described for fractures of both bones. In case the Bond splint is applied two compresses are required, one placed over the lower fragment, which has a tendency to override posteriorly, the other placed upon the lower extremity of the upper

FIG. 59.

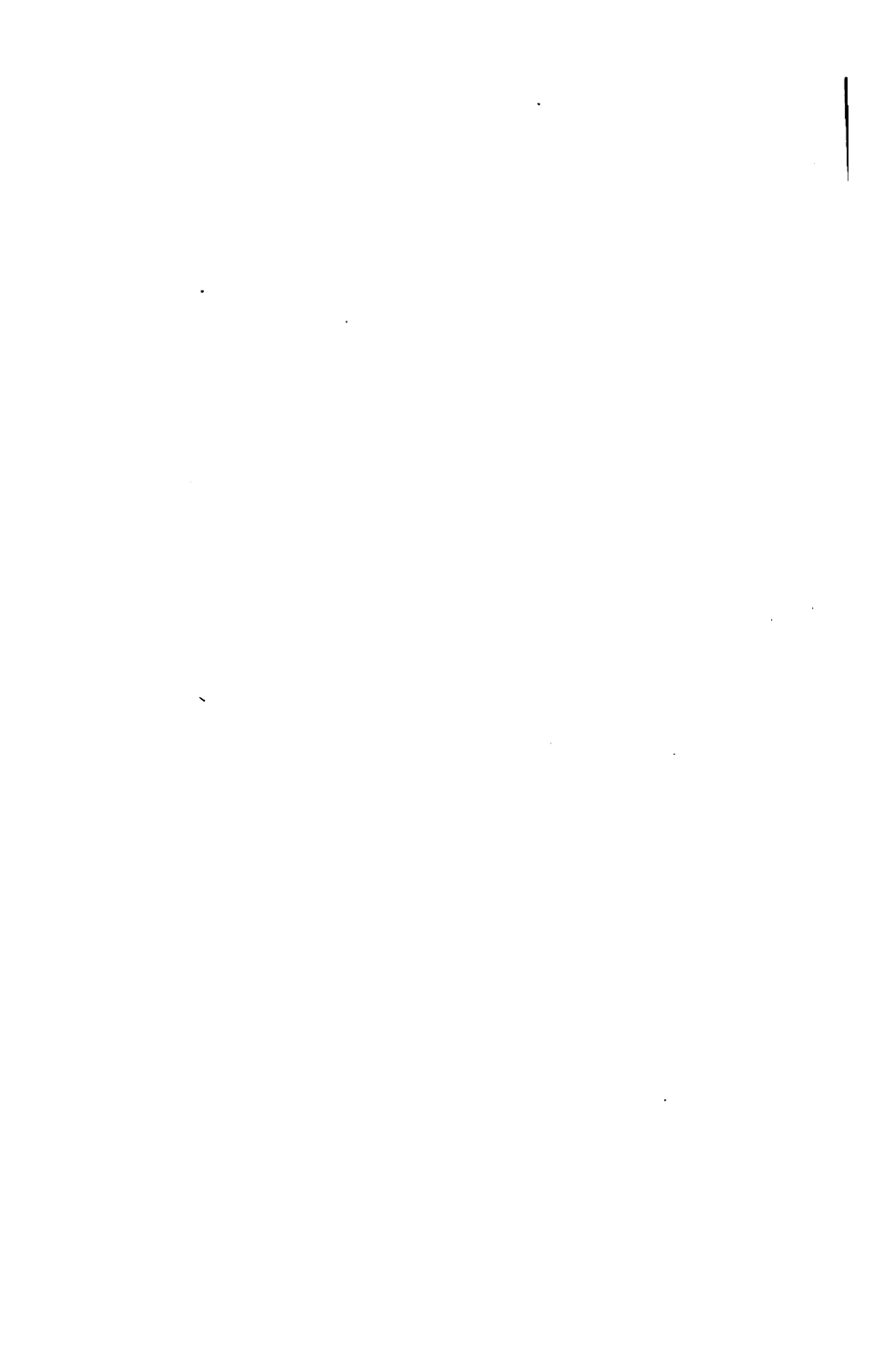


Bond's Splint.

fragment. These compresses are usually wedge shaped and are placed base to base, the base of the palmar compress being placed upon the anterior surface of the forearm, just above the seat of fracture, the base of the dorsal compress upon the posterior surface of the wrist, just below the seat of fracture. These compresses prevent the recurrence of the displacement. Nearly all the splints carry the hand towards the ulnar border, thus correcting displacement to the radial side, which occurs in the fracture. The fingers should be left free, and the patient should be instructed to use them from the third or fourth day.

How are fractures of the ulna dressed?

Fractures of the olecranon are treated by extending the arm, after which the centre of a strip of adhesive plaster, one inch wide and two feet long, is placed just above the upper fragment, which has



been previously drawn down as far as possible. The ends of this strip are then carried obliquely downward and forward across the front of the elbow joint, and are secured around the forearm. A straight splint extending from just below the axilla to the wrist, and well padded, particularly at the position of the elbow joint, is applied to the anterior aspect of the arm. The thick layer of padding at the elbow allows of very slight flexion; this makes a much more comfortable dressing than if extreme extension is maintained. In two weeks passive motion should be instituted.

Fractures of the shaft of the ulna are dressed on two straight splints, as when both bones of the forearm are broken.

Fractures of the styloid process of the ulna are dressed on the Bond splint.

How are fractures of the hand dressed?

Fractures of the metacarpal bones are treated by the palmar splint. This extends from half way up the forearm to the extremities of the fingers, and is as wide as the hand. It should be so padded that when applied the natural concavity of the palm is preserved. If there is a tendency toward backward displacement of the fragments this may be corrected by a small compress.

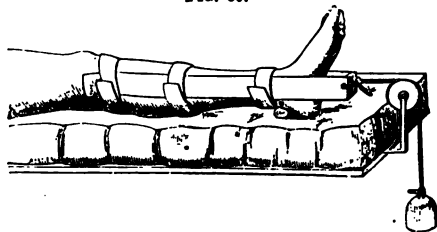
Fractures of the finger are treated by a straight posterior splint and a moulded anterior pasteboard trough. The posterior splint should extend from the wrist to the extremity of the finger, the anterior trough from the web of the finger to its extremity.

How are fractures of the femur dressed?

Since these fractures are attended by a great deal of shortening, permanent *extension* is usually necessary. This is accomplished by means of adhesive plasters. A strip is cut, two and a half inches wide, and long enough to extend from the upper end of the lower fragment on both sides of the limb, leaving a four- to six-inch loop hanging free from below the sole of the foot. In this loop is placed a piece of thin splint board, two and half inches wide, and so long that when traction is made the plaster will stand free from the malleoli. This board is fastened in place, and through a hole in its centre a cord or bandage is passed. One end of the adhesive plaster is placed along the inner aspect of the limb up to the seat of fracture, the other along the outer aspect. This plaster is secured in

place by three or four strips carried around the limb, and a neatly applied spiral reversed bandage of the lower extremity. After an hour or two the plaster is tightly adherent. The extending cord is then passed over a pulley, a weight is attached, and beneath the tendo-Achillis is placed a pad of oakum, sufficiently large to prevent

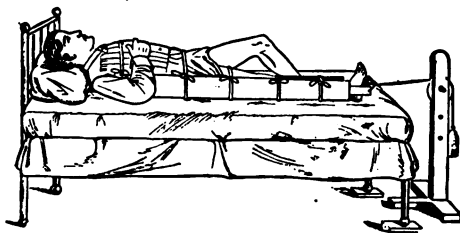
FIG. 60.



Extension Applied for Fracture of the Femur.

the heel from bearing upon the mattress. Counter-extension is provided by raising the foot of the bed. Two sand bags are applied, one to the outer side of the leg, extending from the axilla to below the foot, the other to the inner side, extending from the perineum to the level of the sole. These bags are packed close

FIG. 61.



Dressing for Fractured Femur.

to the leg, and are secured in place by four strips, one passing beneath the body, the other three beneath the leg and thigh. These strips are carried around the sand bags and knotted.

In place of sand bags, bran bags and straight internal and external splints, may be employed. Eversion of the foot is prevented by

looping a bandage around the metatarsus and binding its ends to the internal sand bag ; or a foot-piece with a broad base may be provided, the latter resting upon a framework which allows of sliding motion.

Where there is a tendency towards anterior projection of the upper fragment, this may be prevented by a short anterior splint secured to the thigh, or by the application of a shot bag to the lower end of the upper fragment, or by dressing the fracture on a double inclined plane, extension being applied from the knee in the direction of the long axis of the femur.

Fractures in the middle of the shaft of the femur may be kept more securely in place by supplementing the sand-bag extension by four short straight splints applied to the anterior, posterior, inner and outer surfaces of the thigh and secured in place, either by the roller bandage, or, what is still better, by straps of webbing supplied with buckles. This latter arrangement allows of ready inspection of the seat of injury. In the dressing of all fractures of the thigh and leg, the internal condyle, the internal malleolus, and the inner border of the ball of the great toe, should lie nearly in the same vertical plane, the great toe pointing directly upward.

In impacted fracture extension should not be used.

Fractures of the lower extremity of the femur are best treated by extension and the long fracture box, reaching upward to the middle third of the thigh. If there is a marked tendency to backward tilting of the lower fragment this may be corrected by flexing the knee and splinting in this position, or by cutting the tendo-Achillis.

Fracture of the femur in infants is treated by a carefully padded external splint extending from the axilla to the sole of the foot. This is secured in place by a roller bandage, which is continued as a spica of the groin around the body, holding the splint firmly in place. Over this is applied a plaster or silica bandage. To prevent soiling of this dressing it should receive a coating of shellac. It should not be removed for four weeks.

How are fractures of the patella dressed ?

Fractures of the patella are treated by extending the leg, and flexing the thigh upon the pelvis to an angle of 45° . Next is applied a posterior straight splint, provided with lateral pegs and ratchets. Strips of adhesive plaster long enough to extend from the lower

peg around the upper border of the patella to the corresponding peg on the opposite side of the splint, and in a similar way from the upper pegs around the lower fragment, are now applied above and below the upper and lower fragment respectively, being regularly imbricated *toward the fracture*. The extremities of these straps are fastened to the pegs by turning the latter; the lower fragment is first steadied, then the upper fragment is drawn down into position.

If the edges of the fragments tilt forward this is corrected by the pressure of a piece of strapping carried transversely around the limb.

If there is great swelling, with marked effusion into the joint, the latter should be aspirated before this dressing is employed; or if this is not deemed advisable the inflammation may be combated by rest, elevation, moderate pressure, and cooling and evaporating lotions. The splint should be worn for eight weeks. It should be followed by a plaster dressing continued for two or three months.

FIG. 62.



Fracture-Box.

How are fractures of the leg dressed?

All these fractures may be treated in the fracture-box, applying lateral compresses to correct deformity, and using extension if there is marked shortening. The fracture-box should fix the knee-joint, should be strong, and should hold the leg in such a position that the inner borders of the internal condyle, the internal malleolus and the ball of the great toe lie in the same vertical plane, and the foot is kept nearly at right angles to the leg, pressure being taken off the heel by a pad of oakum beneath the tendo-Achillis. For very marked displacement and difficulty in retention, the hip and knee may be flexed, and the limb may be laid on its outer side and bound to a double-angled external splint for a few days, after which it may be placed in the fracture-box.

The fracture-box consists of a posterior splint, with a foot-piece

and hinged sides ; a pillow is placed in the box, the leg is placed on the pillow, and the sides are brought up and tied.

External, posterior, anterior, and straight moulded splints may also be used for these fractures.

Pott's fracture may be treated by the application of *Dupuytren's splint*. This consists of a straight internal splint, notched at the lower end, and extending from the head of the tibia to a point four inches below the side of the foot. The upper part of the splint is fastened to the inner surface of the leg, a thick pad, not extending below the internal malleolus, is applied to the lower portion, and the foot is drawn close to the splint, in the space beneath the pad, by a figure-of-eight, so applied that there are no turns which make pressure above the external malleolus ; the knee is then bent, and the leg is suspended, or is laid on its outer side.

FIG. 63.



Dupuytren's Splint Applied.

How are fractures of the foot treated ?

Fractures of the foot are treated by the fracture-box and evaporative lotions until acute inflammation has subsided, after which a fixed dressing should be applied.

LUXATIONS.

What are the general principles concerning the treatment of luxations ?

1. The displacement should be reduced immediately.
2. Reduction should be effected by manipulation when possible.

This consists in overcoming the obstacles to replacement by relaxing muscles, relieving from tension tendons and ligaments, and utilizing the mechanical arrangement of the joint to sweep the displaced portion of the articulation over or around bony prominences, into proper position.

3. Muscular resistance should be overcome by ether, pushed to full surgical anaesthesia.

4. The surgeon must not leave the patient till he is certain that reduction is complete.

5. After reduction the joint should be splinted, and the inflammation should be controlled by cooling and evaporating lotions, supplemented, in three days, by massage.

6. A displaced joint is permanently weakened. It should be supported for a long time after apparent recovery.

How are luxations of the lower jaw reduced?

The patient is seated upon a low chair or a stool; the surgeon, standing in front, places his thumbs upon the last molar teeth of each side of the lower jaw, while the fingers are placed beneath the chin; by a sudden pressure downward with the thumbs, while the fingers at the same time press the front of the chin up, the head of the bone is forced out of the zygomatic fossa, and is pulled in place by the external pterygoid, masseter, and the temporal muscles. The thumbs should be withdrawn from between the teeth the moment the bone is felt slipping into place, as otherwise they may be severely bitten; they should also be protected by wrapping them with bandages. Luxations of the lower jaw may also be reduced by inserting wedges between the molar teeth of the lower and upper jaws on each side. On pressing the point of the chin directly upward these wedges act as a fulcrum, and the head of the bone can easily be forced into its proper position. After reduction a Barton bandage should be worn for a few days.

How are luxations of the shoulder joint reduced?

Reduction of the shoulder joint may be effected by several methods:—

1. The heel in the axilla.

The patient is placed flat upon his back; the surgeon seats himself facing the patient, and close by the hip of the injured side. He then places his unbooted heel in the axilla, seizes the wrist and makes firm and steady traction. It is better to make extension from the lower extremity of the humerus; this may be accomplished by folding a sheet and throwing a clove-hitch around the humerus at this point.

2. *The heel upon the shoulder.*

The patient is placed flat upon his back as before; the surgeon seats himself beyond the patient's head, places his unbooted heel upon the top of the shoulder, seizes the wrist and makes firm traction upward in the direction of the long axis of the body.

3. *The crutch lever.*

The arm is flexed upon the forearm and carried out from the body. The well-padded head of a crutch, long enough to rest upon the floor, is fitted into the axilla; the patient then throws his weight on this crutch while the arm is forced down to the side by the surgeon.

Manipulation.—The patient is placed flat upon his back, the

FIG. 64.



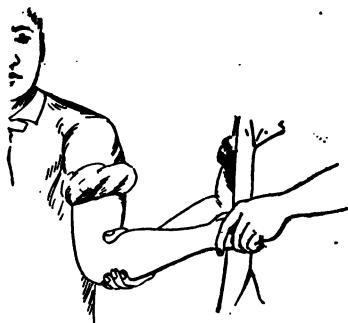
Reduction by Extension.

forearm is flexed upon the arm, and the arm is carried out from the side until the elbow is raised above the level of the shoulders. Using the forearm as a lever, the humerus is then rotated outward as far as possible. The surgeon seizes with his right hand the forearm just below the bend of the elbow, makes pressure with the fingers of the other hand upon the head of the bone, brings the arm down to the side, and rotates it inward, carrying the forearm across the chest. Or an assistant places his fist in the axilla and the arm is swept down to the side and rotated inward as before.

Kocher's Method.—The forearm is flexed upon the arm, and the latter is brought in close contact to the thorax in the axillary line. By means of the flexed forearm as a lever the humerus is

carried into extreme external rotation ; the arm is then forced forward and upward, rotated inward as far as possible, and circumducted over the front of the chest.

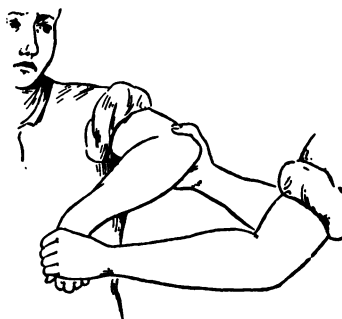
FIG. 65.



Kocher's Method—First Movement.

The backward luxation of the humerus may frequently be reduced by flexing the forearm on the arm, carrying the arm out from the

FIG. 66.



Kocher's Method—Second Movement.

side till the deltoid muscle is thoroughly relaxed, and pushing the bone into place by pressure of the thumb.

The after treatment of shoulder luxations consists in the application of a Velpeau or Désault bandage together with cooling lotions.

1

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After one or two weeks the bandage is removed. The joint may subsequently be supported by means of a spica of the shoulder.

How are luxations of the elbow joint reduced?

Luxations of the elbow joint may be reduced by extreme extension, followed by rapid flexion; or the knee of the surgeon may be placed in the bend of the elbow and the forearm forcibly flexed over this as a fulcrum. Unless the joint can be flexed to an acute angle the surgeon cannot feel assured that reduction has been accomplished.

When the radius alone is luxated the forearm should be flexed

FIG. 67.



Reduction of Elbow Joint Luxation.

and the hand should be supinated if the head of the bone is in front of the external condyle, or pronated if the displacement is posterior to this bony projection. The head of the bone can then usually be pressed into place. In dressing luxations of the radius alone a pad is required since the luxation has a marked tendency to recur.

An anterior angular splint should be applied in the after treatment of all luxations about the elbow joint, and passive motion should be instituted as soon as inflammatory symptoms subside.

How are luxations of the wrist joint treated?

Posterior displacement of the carpal bones is treated by flexing

the hand, pressing the carpus forward, and suddenly extending the hand on the first sign of the bone slipping into place.

The anterior displacement is treated by extending the hand, pressing the carpus backward, and suddenly flexing the hand on the first sign of the bone slipping into place.

Reduction may also be accomplished by extension and counter-extension.

How are luxations of the bones of the hand treated?

Luxations of the metacarpus are treated by extension and direct pressure, after which a palmar splint is applied.

FIG. 68.



Manipulation for Reduction of Backward Luxation.

Reduction of the *phalanx* may be accomplished by traction; or by forcing the finger into extreme extension when the bony prominences are unlocked and the phalanx slips into place.

Backward luxation of the first phalanx on the metacarpal bone of the thumb is at times very difficult to reduce. The metacarpal bone of the thumb should be forcibly adducted into the palm of the hand. The phalanx should then be extended far backward until the thumb nail nearly touches the first phalanx or the metacarpal bone of the thumb the wrist, when it is then suddenly flexed, the thumb of the surgeon at the same time pressing its proximal

extremity into position. If this method fails one or both tendons of the flexor brevis pollicis should be cut.

How are luxations of the hip joint treated?

Backward luxations are treated by first flexing the leg on the thigh and the thigh on the abdomen, and carrying the knee of the affected side somewhat toward the opposite side of the body. While flexion is still maintained the thigh is circumducted, or swept outward; at the same time the foot is rotated outward and the leg is brought quickly down to an extended position by the side of its fellow.

FIG. 69.



Manipulation for Reduction of Forward Luxation.

Forward luxations are treated by flexing the leg on the thigh and the thigh on the abdomen, at the same time abducting or carrying the limb away from the body; it is then circumducted or swept inward, carrying the thigh over the body and making internal rotation, and is quickly brought down by the side of its fellow.

After reduction the knees should be bandaged together for a week, after which passive motion is instituted. The patient should wear a moulded support for several months.

How are luxations of the knee joint reduced?

The thigh is flexed upon the abdomen; then by means of traction and direct pressure the bone may readily be forced into place.

After reduction the joint should be splinted until the subsidence of inflammation, when passive motion should be instituted. The patient should wear a knee-cap for many months.

How are luxations of the patella reduced ?

In reducing lateral luxations the leg is extended upon the thigh and the thigh is flexed upon the abdomen. The margin of the patella furthest removed from the joint is then forcibly depressed. This tilts up and frees its inner border, and the bone is at once snapped into place by the quadriceps.

Rotary luxation of the patella is reduced by alternate flexion and extension or by direct pressure.

How are luxations of the semilunar cartilages reduced ?

By forced flexion, followed by sudden extension. A knee-cap should be worn for one or two years.

How are luxations of the ankle joint reduced ?

The leg is flexed on the thigh and the foot is moderately extended, to relax muscles. Extension is then applied to the foot and counter-extension to the thigh, when by manipulation and pressure the bones can usually be restored to their proper position. The after treatment consists in the subduing of inflammation and the application of a plaster bandage.

Luxations of the tarsal bones are reduced by extension, counter-extension and direct pressure. If this fails the tenotome must be used freely.

VENEREAL DISEASES.

Chancroid.

What is a chancroid ?

A chancroid is an ulcer caused by contact with the secretions of a similar ulcer.

What are the characteristics of a chancroid ?

It has no distinct period of incubation. It may develop in twenty-four hours, though it usually appears in from three to five days after contagion.

A papule first appears; this becomes a vesicle, a pustule, and shortly an ulcer.

It is frequently multiple, causing the appearance of other sores upon surfaces with which it comes into contact.

It is distinctly inflammatory in type; the edges are punched out, irregular, and frequently undermined; the discharge is abundant, the surface is covered by a tough, gray, adherent slough.

It is auto-inoculable; that is, the secretions inoculated upon another part of the body will produce a similar sore.

It is not indurated, and the parts surrounding are no harder than is common to any other inflammation of equal severity.

It has no distinct tendency toward spontaneous cure.

It produces mono-ganglionic, unilateral lymphatic enlargement in the groin; that is, there is a single bubo on one side of the body. If the ulcer attacks the frænum there may be bilateral lymphatic involvement.

As a consequence of chancroid there may be *simple inflammatory bubo*, which usually undergoes spontaneous resolution, or, if it suppurates, discharges laudable pus and readily heals, or *virulent chancroidal bubo*, which exhibits all the characteristics of the original sore.

The chancroid is not followed by secondary eruptions:

What is the favorite seat of chancroid?

Chancroids may be found on any part of the body, but they are usually placed about the genitalia. In this region they commonly appear about the frænum, though they may be found on the prepuce, the glans, the meatus, or any other portions of the organs.

How may the chancroid be complicated?

By inflammation. This complication may occur from mechanical irritation, from excess, or from improper dressing. It is denoted by swelling, pain, blood-stained secretion, and rapid extension. The ulcer shows a marked tendency to undermine the skin, and buboes very commonly accompany this complication.

By sloughing or phagedæna. Constitutional debility predisposes to this complication. It is characterized by the phenomena of inflammation, together with rapid and extensive destruction of tis-

sue. There is usually much pain, and violent hemorrhages may occur.

By serpiginous ulceration. This is attended by very slight constitutional disturbance. The process slowly but steadily extends, undermining the surrounding healthy skin; the edges are uneven and sharply cut; the discharge is thin and sanious.

By phimosis and paraphimosis. These conditions may prove serious complications, since in the one case it is difficult to reach the ulcer and apply the proper treatment, in the other the resulting congestion is so great as to markedly increase the inflammatory phenomena.

With what other ulcerations may the chancroid be confounded?

With herpes, with chancre, with other forms of syphilitic eruption, or with the excoriated form of balanitis.

How is a chancroid distinguished from a chancre?

While the chancroid develops at once after exposure to contagion, the chancre has a period of incubation varying from two to three weeks; moreover, the chancre is generally single, is apparently non-inflammatory in type, giving usually a scanty secretion. It is followed by a polyganglionic, bilateral, lymphatic involvement, these buboes almost never suppurating. It is not auto-inoculable, it is distinctly indurated, and is followed by secondary eruptions.

In spite of the marked difference between typical examples of the two affections, sores will be encountered in which it is impossible to say whether the principal features belong mainly to syphilis, or to the chancroid as a local venereal ulcer. In these cases the test is afforded by inoculation. If, on inoculating the patient with pus of this ulcer, a chancroid is produced, it can be said with certainty that the initial lesion is a simple venereal sore or chancroid. The preferable positions for inoculation are either beneath the nipple or on the outer surfaces of the thigh, since in these regions the sore runs a mild course and is not liable to be followed by chancroidal bubo.

In chancroid within the urethra this is a valuable mode of diagnosis; also in cases of marked phimosis accompanied by symptoms presumably chancroidal, auto-inoculation will enable the surgeon to arrive at a reliable conclusion. It must be borne in mind that the





fact of auto-inoculation succeeding simply shows that the sore is a chancre, and does not exclude the possibility of syphilis subsequently developing, since it is perfectly possible for the contagious matter of both diseases to be received at the same time.

What conditions predispose to the development of a chancre?

The presence of abrasions or ulcerations, a redundant prepuce, lack of local cleanliness.

How are chancres treated?

Since the danger of rapidly destructive inflammation attacking chancres is never absent until they are completely cicatrized, since even the most superficial sores preserve the virulent characteristics of the most marked ulcerations, and may at any time be followed by the simple or chancroidal bubo, the most satisfactory method of treatment consists in the immediate destruction of the entire ulcerated surface, thus substituting healthy granulation for a chancroidal ulcer. This is most readily accomplished by means of the hot iron, or by sulphuric or nitric acid. The important point in this treatment is to thoroughly destroy every portion of the ulcer, since the most minute part left untreated will re-inoculate the entire granulating surface.

The hot iron is to be preferred to other cauterants. The ulceration frequently undermines the skin, extending sometimes to the depth of one or two inches beneath what appears to be a perfectly healthy surface. Every sinus and recess must be acted upon by the cauterant, even at the sacrifice of a great deal of tissue. As a dressing a few layers of dry antiseptic gauze can be applied to the burned surface. On separation of the eschar a healthy ulceration is left, which heals under cleanliness, protection, and the application of the ordinary dusting powders. Where the cautery is objected to, nitric acid may be used. The pain of this application may be blunted by the use of a few drops of a 20 per cent. solution of cocaine. This is applied to the surface of the ulcer; the latter is then dried by absorbent cotton, and the acid is applied by means of a glass rod. Subsequent dressing is the same as after the actual cautery.

A very convenient way of burning chancres consists in the appli-

cation of a plaster made by pouring concentrated sulphuric acid upon pulverized charcoal until a mixture of about the consistency of molasses is made. The chancre is cleaned carefully, dried as far as possible, and this paste is packed into every recess. The advantage of this dressing lies in the fact that the acid shortly evaporates or is neutralized, thus leaving a charcoal dressing to cover the ulceration. By the time this drops off cicatrization is commonly well advanced.

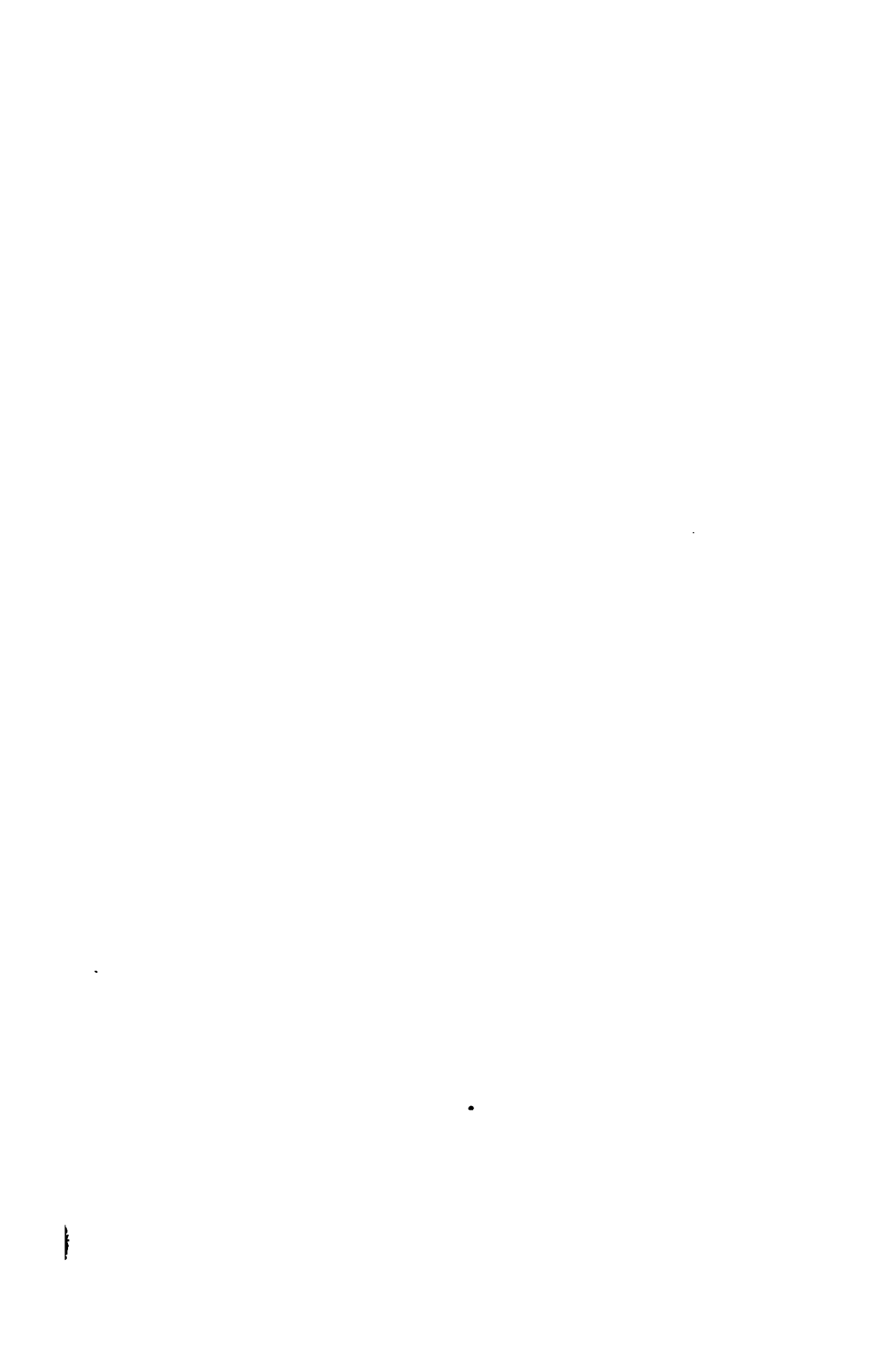
Where there is objection to any form of cauterization milder measures may be employed, and these are in the great majority of cases successful, especially where the sore has invaded healthy tissues and the patient is obedient to medical direction. The most satisfactory palliative treatment consists in washing the sores three times a day in a nitric acid solution, made by adding a drachm of strong nitric acid to a pint of water. The surface of the sore is then dusted with iodoform, to each drachm of which has been added two drops of attar of roses, or with zinc oxide, bismuth subnitrate, or calomel.

Where discharge is profuse, daily spraying with peroxide of hydrogen, full strength, will be found serviceable.

If the chancre becomes complicated by inflammation, in addition to the constitutional treatment suitable to inflammation, evaporating lotions will be found of service. Alcohol and dilute lead water, equal parts, may be applied, a piece of lint being wrung out in this solution and placed about the inflamed parts; this lint should be kept constantly wet. Soaking the chancre in exceedingly hot water many times during the day is often of service, the dressing during the intervals of this treatment consisting of many layers of gauze wrung out in 1-10,000 bichloride solution and surrounded with waxed paper or other impervious material.

If the ulcer becomes *phagedenic*, a general tonic and stimulating systemic treatment is indicated. If the sloughing process is extending very rapidly, threatening great destruction of tissue, the actual cautery should be used unsparingly. Prolonged warm baths continued for hours, or even days, are at times attended by most happy results.

Serpiginous ulceration is exceedingly resistant to all treatment; the constitution is usually at fault, and every effort should be made



to build up the general health. Beyond the actual cautery and prolonged warm baths, local treatment seems to be of little avail.

The simple inflammatory bubo is treated by rest, counter-irritation around the focus of swelling, and pressure. Pressure may be applied by means of a compress and spica bandage, or, if the patient is confined to bed, by means of a shot bag or sand bag placed over the inflamed part. Threatening suppuration can sometimes be aborted by the injection of 10 to 20 minims of a 5 per cent. solution of carbolic acid into the centre of the gland. When fluctuation is detected a free opening should be made; laudable pus escapes and the abscess heals kindly.

Until it is evacuated *the virulent bubo* cannot be diagnosed from that due to simple inflammation, and the same treatment is applicable as in the first instance. If on incising the swelling a thin, sanious pus is discharged and the incision steadily enlarges, being attacked by the characteristic chancroidal ulceration, the treatment is the same as in the case of a chancroid. Repeated washings with carbolic lotion, or a weak nitric acid solution, followed by a liberal application of iodoform, may be tried. If the ulceration steadily extends, every sinus and recess must be slit up, all sloughs removed by the curette, and the whole surface thoroughly cauterized, preferably by nitric or carbolic acid.

Where *phimosis* complicates the chancroid, the discharge must be kept constantly washed away by repeated injections of warm water, followed by one or two syringefuls of dilute carbolic solution, dilute nitrate of silver solution, 4 grs. to the ounce, or the nitric acid lotion. If pain, swelling and discharge denote a rapid increase of trouble, the prepuce should at once be slit up, and the chancroid scraped and cauterized. The cauterant should also be applied to the edges of the incision.

If *paraphimosis* complicates the chancroid, cooling and evaporating lotions are indicated, unless there is a sufficient degree of constriction present to threaten gangrene. When reduction cannot be effected in other ways, incision of the constricting ring of tissue will be required.

Gonorrhœa.

Describe the urethra.

The urethra varies in length from eight to nine inches. It consists of three portions, *spongy*, *membranous*, and the *prostatic*.

The *spongy portion* extends from the meatus to the anterior layer of the triangular ligament, and is about six inches in length. The *meatus* is the narrowest portion of the urethra. One and one-half inches posterior to it is the *lacuna magna*, a large mucous follicle placed on the upper surface of the urethra with its opening directed forward. In this follicle small instruments may readily catch unless their points are kept along the floor of the urethra. The *bulbous portion* of the urethra lies just in front of the anterior layer of the triangular ligament. At this point the canal is considerably dilated. This is the widest and most dilatable portion of the whole urethra.

The *membranous portion* of the urethra is that part of the tube which lies between the anterior and the posterior layers of the triangular ligament. It is about three-quarters of an inch in length, and is placed one inch below the pubic arch. It is cylindrical in shape, and, excepting the meatus, the narrowest part of the urethra. It is surrounded by the compressor-urethræ muscle.

The *prostatic portion* of the urethra is about one and a quarter inches long. It passes through the upper portion of the prostate gland.

The urethra is further divided into an *anterior* and *posterior part*.

The *anterior part* is that portion external to the anterior layer of the triangular ligament. It is surrounded by erectile tissue.

The *posterior part* includes the membranous and prostatic urethra, and is enveloped in a thick layer of strong muscular tissue. The compressor-urethræ muscle surrounding the membranous portion of the urethra is readily excited to reflex spasm; hence, fluids injected into the urethra rarely reach further than this point, and discharges occurring within or behind the membranous urethra are more prone to flow into the bladder than to escape externally.

What is gonorrhœa?

Gonorrhœa is a contagious specific inflammation affecting mucous membranes, particularly those of the genito-urinary tract.

What is the cause of gonorrhœa?

The gonococcus introduced into the urethra. The contagion may be mediate or immediate. *Immediate* by means of direct personal contact; *mediate* through the medium of clothing or other articles containing the specific microörganism.

A non-specific urethritis may develop from contact with foul and irritating discharges; this ordinarily undergoes spontaneous resolution in a few days. Gonorrhœa begins in the male usually in the fossa navicularis and passes backward. In the female it commonly begins in the urethra or in the cervix, though vulvitis and vaginitis are frequently the first conditions observed by the surgeon.

What are the symptoms of gonorrhœa?

In from three to five days after exposure to contagion a tickling sensation is noticed at the meatus; this is shortly changed to a burning, noticed particularly during urination. On examination the lips are somewhat reddened and everted, and there is a slight mucopurulent discharge; this discharge rapidly increases. The ardor urinæ becomes intense; there is a profuse flow of pus; painful erections occur during the night, and the patient is compelled to urinate frequently.

These symptoms continue for from fourteen to twenty days, the inflammation in the meantime having extended back to the bulb, as denoted by a feeling of fullness and heat in the perineum. At about the end of the third week the symptoms rapidly subside, the discharge becomes scanty and mucous in character until it is finally reduced to a drop, which is noticed in the morning as glueing the lips of the meatus together. If the case runs a favorable course this disappears, and in about six weeks from the beginning of the attack recovery is complete. The disease, however, may extend back to the posterior part of the urethra and assume a chronic form. Extension of the disease to the posterior urethra rarely takes place before the third week. The extension may be accompanied by no subjective symptoms, or may be denoted by vesical tenesmus, by hæmaturia, by burning or lancinating pains in the deeper part of the perineum, exacerbated by micturition and defecation, and by frequent pollutions accompanied by pain in the deep urethra. The discharge

is similar to that of anterior urethritis. It does not appear at the meatus, however, but passes back into the bladder.

What are the stages of acute anterior urethritis?

- (1) Increasing stage.
- (2) Stationary stage.
- (3) Subsiding stage.

What are the symptoms of the increasing stage?

Ardor urinæ; purulent discharge, increasing in quantity; painful erections; frequent urination, the stream passed being small, forked and irregular. These symptoms may, in individual cases, be present in all degrees of severity.

What are the complications of the first stage?

Balanitis and *Posthitis*. Inflammation extending over the mucous layer of the glans penis and the foreskin.

Phimosis, or inability to retract the foreskin, usually due to œdematous swelling.

Paraphimosis, or inability to draw the retracted foreskin forward.

What are the symptoms and complications of the second or stationary stage of acute gonorrhœa?

The inflammation gradually extends backward. The symptoms of the first stage continue, alternating in severity from day to day. The following complications may be developed:—

Follicular Abscesses. These appear as small, round, tender tumors along the floor of the urethra. They may evacuate their contents either into the urethra or externally.

Periurethral Abscesses. These are most commonly found about the fossa navicularis or the bulbous portion of the urethra, where the disease is most persistent.

Lymphangitis. This is commonly due to retention of the discharge beneath the prepuce. The latter becomes swollen, and there is a thick, tender, reddened, cord-like line extending along the dorsum of the penis.

Bubo. But one gland is commonly affected, this may undergo spontaneous resolution or may suppurate.

Cowperitis. Characterized by intense throbbing pain, painful

urination, especially at the end of the act, owing to the contraction of the compressor urethræ muscle, and the detection of the hard inflamed glands by examination along the perineum or through the rectum. The second stage lasts one or two weeks.

Give the symptoms and complications of the stage of subsidence.

The symptoms are the same as those of the preceding stages, excepting that they steadily grow less in severity. The complications which may develop at this period are *prostatitis* and *epididymitis*.

Prostatitis is characterized by pain at the neck of the bladder, increased by defecation and micturition. The pain becomes very intense, and the perineum feels full, hot and throbbing. On examination per rectum the diagnosis is made positive by the detection of a hot, tender, enlarged prostate. This inflammation is commonly accompanied by the characteristic constitutional symptoms of acute inflammation. It may terminate in resolution, in abscess, or in chronic inflammation.

It may take the form of *simple congestion*, denoted by the symptoms detailed above, together with enlargement and tenderness found on rectal examination. This is the most frequent form of inflammation which attacks the prostate in the course of acute posterior urethritis. It usually subsides in a few days.

Or the inflammation may appear as an *acute folliculitis*, due to some cause exciting a renewed intensity of posterior urethritis, such as excessive drinking or coitus. The symptoms are the same as before; the patient complains of shooting pains during the passage of the last drops, there is a burning pain during urination located in the deep urethra, and rectal examination shows the prostate not materially enlarged, but presenting one or two sharply defined nodules, usually in one lobe only; these are indurated, markedly contrasting with the soft condition of the remainder of the gland. The nodules are painful on pressure.

Parenchymatous prostatitis, in addition to the symptoms accompanying the other forms, produces marked constitutional reaction. The local symptoms, too, are exceedingly severe, and rectal tenesmus may accompany the spasm of the bladder. Examination shows the

prostate very greatly enlarged, this tumefaction sometimes being sufficient to cause retention of both urine and fæces. At the end of from five to seven days the inflammation may undergo spontaneous resolution, or suppuration may occur.

In the latter case the pain becomes aggravated and throbbing, and the patient complains of rigors or chills; pus formation is exceedingly rapid. At times these prostatic abscesses develop, although the patient complains of very slight symptoms.

Epididymitis is characterized by pain of an intense and sickening character, radiating from the epididymis along the cord and the loins. The epididymis is swollen and tender; there is commonly marked fever. Epididymitis is very frequently accompanied by effusion into the tunica vaginalis. In this case the swelling may be diffused rather than localized at the back of the testis.

Describe subacute or catarrhal gonorrhœa.

This form of gonorrhœa usually occurs in persons who have had previous attacks. It is characterized by very free discharge, with absence of other symptoms or complications. It yields readily to treatment, but does not entirely disappear, a drop or two of mucus being discharged daily.

What are the complications of subacute gonorrhœa?

Gonorrhœal rheumatism or urethral synovitis. This is characterized by comparatively slight constitutional symptoms at first, and by rapid development of synovitis, affecting by preference the knee, the ankle, the wrist, the finger or the elbow.

Gonorrhœal endocarditis, gonorrhœal ophthalmia.

Describe irritative or abortive gonorrhœa.

The symptoms are those of beginning acute gonorrhœa; that is, there is redness, itching and tingling of the meatus, with a slight discharge. The disease, however, does not advance beyond this point. These symptoms may persist for several days and then disappear; there may be no complications nor sequelæ.

How is acute gonorrhœa diagnosed?

By the presence of the gonococcus. These microorganisms are usually abundant and readily found; this is so universally true that failure to discover them on careful examination justifies the conclu-



sion that an acute case of urethritis is not really gonorrhœal in nature.

What are the characteristics of the gonococci?

Under a high magnifying power they resemble coffee beans, their concave sides being directed toward each other. They are found in groups or colonies associated in twos; they do not appear in chains; colonies of the gonococci are nearly always found within pus and epithelial cells.

The staining of the gonococci is characteristic; the most convenient way of effecting this is to place a fraction of a drop of the gonorrhœal discharge upon a cover-glass, place over this another glass, and by pressing the two together diffuse the matter over the surface; place the cover glass in the air to dry, then pass it three times, slowly, through the flame of an alcohol lamp. This cover-glass preparation is then dropped pus side downward upon a solution made by coloring distilled water with a few drops of an alcoholic solution of fuchsin. Subsequent decolorization by Gram's method makes the diagnosis still more sure, since the gonococcus readily gives up its stain, thus differing from other microorganisms.

How is acute anterior urethritis distinguished from that attacking the posterior urethra?

By an examination of the morning urine. If the disease invades the anterior urethra alone, the discharge which is accumulated during the night will be washed away by the first portion of urine passed on rising, and the last portion will be clear. If the discharge takes place from the membranous or prostatic portion of the urethra it will flow backward, and will be diffused in the urine contained in the bladder; hence, though the first portion of the urine may contain an excess of pus and mucus washed from the anterior urethra, the last portion will also be found to contain the characteristic gonorrhœal discharge.

What elements in the urine denote the continuance of urethral inflammation?

Pus, mucus and clap-shreds. Clap-shreds consist of small filaments, which can be seen floating in the urine by the naked eye. On microscopic examination they are found to be composed of pus

cells entangled in mucin, the mucous discharge of the urethra having been coagulated by contact with the acid urine.

What is the prognosis of acute gonorrhœa ?

The prognosis must always be guarded, particularly in the case of strumous, feeble, or cachectic individuals. Though this disease commonly runs an uncomplicated course and ends shortly in complete cure, it may continue for months or years.

A first infection usually runs a more rapid course than subsequent attacks.

When the disease remains limited to the anterior urethra the chances for rapid recovery are much more favorable than when it has extended to the posterior urethra.

What is the treatment for acute anterior urethritis ?

Prophylactic.—Prolonged and repeated coitus has a marked influence in encouraging the entrance of the gonococcus into the urethra. Hence a brief contact is desirable from a prophylactic standpoint. Immediate urination after coitus and thorough washing of the penis should also be practised. The wearing of a clean strong rubber pouch is the most effective way of guarding against contagion.

Curative.—As much bodily and mental rest as possible should be recommended ; rest in bed is a most efficient means of shortening the disease, or at least of insuring a mild course. This, however, is rarely possible, since the necessity for secrecy forces the patient to continue his daily routine of life. Violent physical exertion should be positively interdicted. Diet should be light, with a minimum amount of meat, and total avoidance of puddings, pies, highly seasoned foods or indigestible articles. An exclusively liquid diet, together with large quantities of alkaline waters, is not to be recommended, since this frequently disorders the stomach.

A suspensory bandage arranged to support and elevate the external genitalia should be worn from the first. Sexual excitement, even that resulting from meretricious reading matter, must be strictly avoided. The patient should sleep on a hard bed with the lightest covering compatible with comfort. The bowels must be kept open.

If the *ardor urinae* becomes so marked as to cause serious discomfort a prescription such as the following should be given :—

R. Potass. bicarb., f℥vj
 Tr. hyoscy., f℥iv
 Mucilag. ulm., f℥vj. M.

SIG.—Tablespoonful in a glass of Vichy water every 3 hours.

Great relief will be obtained by immersing the penis in hot water during urination, or by the application of a 4 to 10 per cent. solution of cocaine to the meatus just before the water is passed. This may be conveniently accomplished by wrapping the end of a match in a small piece of absorbent cotton, dipping the latter in a cocaine solution and passing it within the urethra to the depth of one inch. In three minutes the effect of the drug will be produced.

If the penis swells and becomes œdematous it may be wrapped in cloths saturated in the following solution:—

R. Ext. hamamel. fl.,
 Alcohol,
 Aquæ, aa f℥iv. M.

SIG.—Locally.

Painful erections are best combated by camphor, lupulin, and bromide of potassium administered by the mouth, though care must be taken that the stomach is not disordered thereby. To be efficient these drugs must be administered in full doses; from thirty to sixty grains of bromide may be taken at bedtime, and the dose may be repeated during the night if the symptoms require it. Lupulin should be given in from five- to ten-grain doses.

Probably the best means of controlling painful erections is the administration hypodermically of a quarter of a grain of morphia together with a sixth of a grain of atropia, into the perineum, either on retiring or during the night. The patient should be instructed to rise once or twice and micturate. Suppositories may also be employed. Of these perhaps the best is one containing extract of hyoscyamus, gr. $\frac{1}{2}$; extract of opium, gr. j.

When the discharge is free it will be necessary to devise some plan by which it may be prevented from soiling the clothing. This may be accomplished by retracting the prepuce, covering the glans penis with absorbent cotton and drawing the foreskin forward; or by cutting, in a small, square piece of muslin rag, a slit sufficiently large to admit the head of the penis; this opening is carried back until it is behind the corona, a wad of cotton is then applied to the

meatus and the foreskin is drawn forward. This dressing separates the mucous surfaces of the glans and prepuce and prevents the development of balanitis, while, at the same time, it allows of the retention of a comparatively large wad of cotton. Where the discharge is very free and this is not sufficient, or where the conformation of the organ is such that this dressing cannot be retained, the patient may be instructed to pin a small muslin bag or the foot of a stocking to his shirt; in the bottom of this bag is placed a sufficient quantity of cotton, which receives the discharge, the penis being so dressed that it hangs in the bag.

During the increasing stage of gonorrhœa, local or systemic remedies must be used with extreme caution, since there is great danger of increasing inflammation, and thereby favoring the growth and the extension of the gonococci. From the beginning of the attack the following remedies may be administered by the mouth, with the idea of rendering the urine aseptic and thus inhibiting the growth of the germs :—

R. Salol, gr. x
 Balsam of copaiba, ℥j.
 Encapsulat.

SIG.—Take one such capsule four times a day.

Injectons or local applications should rarely be used until the height of the inflammatory stage is past. This will be in from seven to fourteen days. Then the following injection will be found useful :—

R. Sulphocarbolate of zinc, gr. v
 Bichloride of mercury, gr. ij
 Hydrogen peroxide (Marchand), . . . f ʒ iss
 Water, q. s., f ʒ viij.

This injection must be given in such a strength that it does not cause severe pain or excite marked inflammatory reaction.

The general principles covering all injections are that the urethra should be cleansed by urination immediately before the introduction of the injection, that the latter should be introduced gently and with uniform pressure, and that a sufficient quantity should be introduced to distend the entire anterior urethra. The best syringe for this purpose is one provided with a conical point, which fits the meatus

rather than enters the urethra, and which has a piston-rod which slips easily and without any irregular or jerking motion. A soft rubber bulb provided with a conical point, answers the requirements of an injection apparatus better than any of the instruments provided with a piston-rod. The injection should be made at first twice a day, the patient being instructed to add water to the solution employed until it is no longer acutely painful. As the disease becomes more chronic in type the injections may be employed more frequently, five or six a day being administered. In place of the solution given above, any of its ingredients may be given individually, rose water being used as an excipient.

A very successful means of treatment and one which may be

FIG. 70.



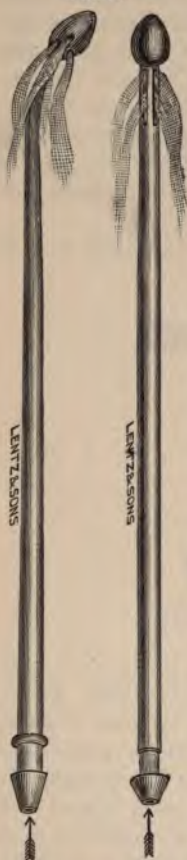
Tube for Irrigating the Anterior Urethra.

employed in the very beginning of the disease, consists in copious injections of hot bichloride of mercury solutions 1-40,000. Two to four pints of this lotion are injected twice a day, by means of either a nozzle fitting into the meatus and provided with an entrance and exit pipe, or a catheter provided with a bulb at its extremity and with the openings pointed backward. If the latter is used it is introduced down to the membranous portion of the urethra; to its extremity is attached the pipe coming from the irrigating apparatus, and the bichloride lotion is allowed to flow from behind forward. Starting with a temperature of about 105°, the solution is gradually made as hot as the patient can endure.

The abortive plan of treatment has been revived in recent times.

For this purpose solutions of nitrate of silver, varying in strength from eight to sixteen grains to the ounce, may be employed. After urination, a syringeful of this solution is injected into the urethra. This is retained for one or two minutes, it is then allowed to escape and a one per cent. solution of sodium chloride is injected, to neutralize any excess of nitrate of silver which may remain.

FIG. 71.

Retroinjection
Catheters.

These injections may be repeated every third day, and are said to be frequently followed by a cure of disease in from seven to twelve days. The inflammation following these injections is combated by entire rest, the application of heat or cold, evaporating lotions, etc. The pain attendant upon them may be greatly diminished by the previous injection of a four per cent. solution of cocaine.

It must be borne in mind that, even though the discharge has ceased entirely, it is not safe to suddenly discontinue the injections. These should be continued for at least twelve days after the subsidence of all symptoms, and should then be dropped very gradually. During the subsiding stage of the disease, if the discharge seems to resist the injections advised above, the use of soluble urethral bougies is frequently attended by very satisfactory results. A bougie containing sulphate of zinc half a grain, oxide of zinc two grains, and hydrastis canadensis five grains, may be introduced on retiring, and may be secured in place by a small pledget of cotton strapped over the meatus by adhesive plaster.

How do you determine as to whether or not acute anterior urethritis is cured?

By an examination of the morning urine. If this contains no pus, no mucus, and no clap-shreds, the disease can be regarded as

definitely cured. If, however, pus and clap-shreds are found, even though the patient declare positively that he is entirely free from symptoms, treatment must not be intermitted.

Frequently there will remain for months after a gonorrhœa is definitely cured a slight discharge of mucus. This perhaps is a clear drop, particularly noticeable in the morning, and annoying the patient by gluing the lips of the meatus together. For this condition local treatment is usually worse than useless. Strong astringent medication will cause irritation and subacute inflammation of the urethral mucous membrane, and will probably cause the discharge to become purulent. The hyper-secretion of mucus will gradually diminish, however, under general hygienic and constitutional treatment. If microscopic examination shows absence of pus the surgeon should not be induced to consent to local treatment, even though this discharge persist for weeks or months.

What is the treatment of acute posterior urethritis?

As in the case of anterior urethritis, during the continuance of hyper-acute inflammation all local treatment must be avoided; even topical applications to the anterior urethra must be stopped the moment frequent and painful micturition together with other symptoms of the extension of the disease into the posterior urethra appear. The symptom demanding most attention is usually violent tenesmus, often accompanied by bleeding. The patient is tortured by a constant desire to urinate, a desire entirely unrelieved by passing the few drops which remain in the bladder, and at the end of the act he may have a free flow of blood. Here the general antiphlogistic treatment of urethritis is applicable. The urine must be made bland by moderate dilution by means of slightly alkaline effervescing waters, partial milk diet, or the free administration of bicarbonate of soda or citric acid. The bowels must be kept soluble, and bromides and other sedatives may be administered by the mouth. The most prompt relief will follow hypodermics of morphia and atropia introduced into the perineum, or the employment of opium and belladonna suppositories.

Prolonged warm baths are also of great service, and should be taken night and morning. At times reflex spasm is so great that dysuria develops. The catheter should be used only as a last resort,

and the softest instruments that can be introduced should be employed. Even during the height of inflammation the capsules advised before may be administered, unless they seem to aggravate the local condition; if this is the case they must at once be discontinued. If the acute symptoms have disappeared, after three or four days local treatment may be instituted. Applications, to be of service, must, of course, be brought in contact with the inflamed mucous membrane; this can be accomplished only by means of instruments carried into the posterior urethra. A soft rubber catheter, together with an ordinary surgical syringe, the nozzle of which fits into the extremity of a catheter, will answer well for this local treatment. The catheter should be introduced until urine begins to flow, when it is withdrawn until the flow ceases. The nozzle of the syringe is then inserted into the end of the catheter, and from an ounce to an ounce and a half of the following prescription injected, the catheter being slowly withdrawn during the course of the injection. Since posterior urethritis is always accompanied by inflammation of the anterior urethra, it is perfectly proper to apply the injection to the whole mucous canal.

Carbolic acid, 2 grains,
 Distilled water, 2 ounces.

Or—

Nitrate of silver, $\frac{1}{2}$ to 2 grains,
 Distilled water, 2 ounces.

Not more than two ounces of either of these solutions should be injected at one time, and the injection should not be repeated more frequently than once every second day. The nitrate of silver injections are particularly valuable, and the strength of the solution should be gradually increased as the mucous membrane becomes more tolerant of the action of the drug.

The inflammation of the posterior urethra is usually cured before that of the anterior portion of the tube. When examination shows that the second urine is clear, while the first contains pus and mucus, posterior applications may be discontinued. The treatment of anterior urethritis may then be kept up by the ordinary clap syringe, as advised above.

How are the complications of acute urethritis treated?

Balanitis and *Posthitis* are treated by retracting the prepuce and bathing the penis in dilute carbolic lotion, 2 per cent., or weak bichloride solution. The parts are then carefully dried with absorbent cotton, dusted with a little bismuth powder or oxide of zinc, and a layer of absorbent cotton is laid over the glans penis so that the mucous surfaces do not come in contact when the foreskin is drawn forward. Where there are superficial ulcerations these may be quickly healed by brushing with a 4 per cent. solution of nitrate of silver, or by touching with the solid stick. If the discharge is very profuse powdered tannin acts well as a dusting powder.

Phimosis requires careful cleansing; the whole prepuce should be douched out by means of an ordinary injection syringe, and this process should be repeated many times until all the discharge is cleared away. A solution of nitrate of silver, four grains to the ounce, is then injected, and the penis is wrapped in cloths wet with lead water and laudanum. The pus should be evacuated by means of these washings at least six times during the day, and the nitrate of silver solution should be employed morning and night. Very marked œdema may require scarification. At times splitting up of the foreskin or circumcision may be necessary.

Paraphimosis should, if possible, be reduced as soon as discovered; this may sometimes be effected by manipulation, or if this fails the glans may be covered with lint and enveloped from before backward in an elastic band. A director is then slipped beneath the constricting ring, the elastic wrappings are removed and an effort made to draw the prepuce forward. If this fails the paraphimosis must be reduced by making an incision.

Follicular and periurethral abscesses are in the first place treated according to the principles governing the therapeutics of all acute inflammations; both the local and general treatment of gonorrhœa must at once be discontinued. Cold compresses, or hot fomentations, or the hot-water bag may be employed. If fluctuation is detected an external opening should be made. Where urinary infiltration is threatened, or has already occurred, the treatment consists in free incision, and the insertion of a soft catheter into the bladder, the latter being allowed to remain. Should the inflammation undergo partial resolution, but leave an indurated nodule, local inunctions of mercury

ointment may be advised. Where this induration is at all extensive erections must be carefully guarded against until absorption has taken place, as otherwise rupture and serious hemorrhage may follow.

Inflammation of the follicles of the meatus are treated by thrusting the sharp point of a stick of nitrate of silver into the glands.

Cowperitis. In addition to the general treatment suitable to inflammations this complication may be combated by ice bags to the perineum. Cowperitis is subject to the same treatment as periurethral abscesses.

Prostatitis demands prompt suspension of local treatment directed against the gonorrhœa. The bowels must be kept soluble and the urine should be rendered bland and antiseptic. Troublesome symptoms are combated by perineal hypodermics of morphia and atropia. Rest in bed, counter-irritation applied to the perineum, preferably by means of small, repeated blisters, and copious injections of very hot water, are usually successful in preventing suppuration. A fountain syringe is provided, large enough to hold two quarts of fluid, a supply pipe from this is attached to a two-way rectal tube, and the latter is introduced into the anus so that the stream flowing from the irrigator impinges directly upon the inflamed and enlarged prostate. Starting at about 105° the temperature of the injection fluid is gradually raised until it is made as hot as the patient can endure. Two quarts of water are thus injected twice a day, and a hot water bag is worn against the perineum during the intervals of treatment.

At times injections of cold water seem to produce a more prompt effect. The choice will depend to a great extent upon the feelings of the patient. When suppuration takes place the abscess cavity must be incised through the perineum and treated in accordance with ordinary surgical principles.

Should retention of the urine occur, not relieved by prolonged hot baths and opium and belladonna suppositories, a soft catheter may be passed.

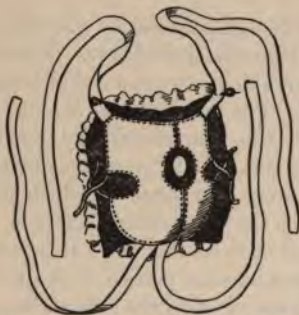
What is the treatment of epididymitis?

The treatment of acute epididymitis is conducted on the same general lines as in the case of any local inflammation. Rest, elevation, counter-irritation, etc., are all indicated.

The dressing which is most satisfactory in the treatment of this affection is applied as follows :—

The testicles are enveloped in a thick layer of cotton ; outside of this, and of sufficient size to envelope the entire scrotum, is placed a piece of rubber or other impervious material. The dressing is then completed by a suspensory bandage gored at the sides and provided with lacings, so that it may be tightened to accurately fit the testicles. By means of this dressing the patient may pursue his ordinary avocations without inconvenience to himself and without materially complicating or lengthening the course of his disease. This dressing accomplishes the good derived from pressure, heat and moisture—

FIG. 72.



Suspensory Bandage for Epididymitis.

all powerful means of combating acute inflammations. It may be used from the beginning, and is frequently followed by relief of pain within half an hour of its application.

Since epididymitis is frequently complicated by effusion into the tunica vaginalis, the latter may be punctured, and the evacuation of serum thus accomplished often markedly alleviates the suffering of the patient. The knife should not be carried into the substance of the epididymis or through the tunica albuginea testis. After all symptoms of acute inflammation have passed there is frequently left an indurated spot about the tail of the epididymis. Every effort should be made to cause the absorption of this induration, since, if it remains, it may entirely cut off the secretion of the testicle, and,

where the disease is bilateral, may result in sterility ; hence continuance of the dressing described above, combined with local applications of mercury and belladonna ointment, is desirable.

CHRONIC GONORRHOEA.

What are the causes of chronic urethral discharge ?

- (1) *Urethral catarrh.*
 - (2) *Chronic gonorrhœa*, and localization of the disease, producing granular surfaces.
- Stricture of the Urethra.* This is the usual cause of gleet.

How can the nature of chronic urethral discharge be determined ?

Urethral catarrh immediately follows gonorrhœa, and presents no symptoms beyond a thin watery discharge. Microscopic examination of this discharge shows that it is composed of mucus, mucous corpuscles and epithelium. Pus corpuscles are absent.

Chronic gonorrhœa is characterized by a more or less profuse discharge of creamy pus. It is greatly aggravated by any excess, and exacerbations occur, the cause of which cannot be definitely determined. During the exacerbation there is frequently burning during urination, and at times chordee. It is usually located either in the bulbous or membranous portion of the urethra, or about the navicular fossa. Examination by the bulbous bougie detects a tender spot, and pus and blood may be brought away on the shoulder of the instrument.

Gleet and stricture often appear some time after the apparent cure of an attack of gonorrhœa. This is characterized by a muco-purulent discharge, and, if the stricture becomes contracted by frequent urination with an imperfect cut off. On passing a bulbous bougie narrowing is detected.

How can the seat of chronic urethral disease be determined ?

It is of the greatest importance to distinguish between chronic urethritis located in the anterior urethra and that which has its seat in the posterior portion of the canal. This can readily be determined by an examination of the urine. If the first portion of the urine passed on rising contains pus, while the second is clear, the seat of

the discharge is necessarily located anterior to the compressor urethræ muscles. If, however, the last urine contains the discharge of chronic gonorrhœa this shows that the posterior urethra is invaded. The accurate localization of the process may be further determined by the passage of bulbous bougies, and by the use of the urethroscope. If there is erosion of any part of the urethra, as the bougie slips over this portion the patient will complain of pain. One examination is not sufficient on this point; it is only when, after the repeated passage of instruments, pain is referred to one particular spot, that the surgeon can be sure that here is located a focus of disease.

If the discharge is persistent in spite of careful treatment the urethroscope should always be used. A straight hard rubber tube, provided with a rounded obturator which projects somewhat beyond the end of the instrument, represents the simplest form of this instrument. To allow of a satisfactory view the tube should be of as large calibre as can be passed into the urethra, and should be just long enough to reach the bladder when the penis is shortened as much as possible. This instrument is introduced until the bladder is reached, the urethroscopic tube is slightly withdrawn, and the surgeon reflects from a head mirror as strong a light as possible into the urethroscope. As the tube is withdrawn the various portions of the urethra are exposed to view. When pus and blood obstruct the field of vision they can be removed by pledgets of cotton carried in by long applicators. This permits of a most accurate diagnosis. The Leiter incandescent urethroscope affords a much better illumination, but the cheaper and simpler instrument will be found to give satisfactory results.

The extent of inflammation can further be determined by examination of the urine. If the latter contains only clap-

FIG. 73.



Urethroscope.

shreds the probabilities are that the disease is localized; if, however, large quantities of mucus are present it is almost certain that an extensive area of mucous membrane is involved in the inflammatory process.

Give the treatment of chronic urethral discharge.

Urethral catarrh is denoted by profuse mucous discharge; if not accompanied by foci of ulceration or by narrowing of the urethra, it is best treated constitutionally. Open air, nourishing diet, tonics, iodide of iron, in fact everything which tends to improve the patient's general condition, should be advised.

If any local treatment is adopted it should be of the mildest character. The internal administration of copaiba, cubebs and salol may be supplemented by very weak injections of a .5 solution of sulphate of zinc, nitrate of silver, or sulphate of copper.

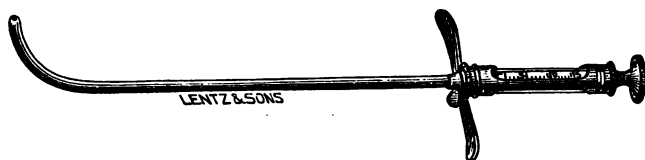
When in addition to the general catarrhal condition, there are likewise areas of ulceration, the general catarrhal congestion has first to be subdued; this is best combated by the means just described, one injection being given twice daily. If the posterior urethra is also involved in the catarrhal process, the same solutions may be used, but should be introduced by means of a rubber catheter passed to the prostatic portion of the urethra; through this the injecting fluid is slowly forced as the catheter is withdrawn from the urethra. These irrigations should be repeated every second or third day, depending upon the amount of reaction they excite.

When, on examination, the urine is found to contain only shreds or flocculi, the mucous secretion having disappeared, it may be assumed that the general catarrhal condition is allayed. Treatment may now be directed to the ulcerated foci. If the seat of the disease is located in the anterior urethra it may be conveniently reached by the hard rubber endoscopic tube. The astringent solutions are applied by means of cotton wound on a long applicator; four per cent. solutions of either nitrate of silver or sulphate of copper may be employed. When used in this strength the medication should be brought in contact only with the diseased surface.

When the disease is located in the membranous or prostatic portions of the urethra, a few drops of either copper or silver solution,

varying in strength from one to two per cent., may be introduced by means of Ultzmann's prostatic catheter; glycerin should be employed as a lubricant for the instrument, since oil protects the mucous membranes from the action of the remedies. A very excellent method of treating inflammation of the posterior urethra is offered in the

FIG. 74.



Ultzmann's Prostatic Catheter.

form of lanolin ointment. For the purpose of applying this a catheter provided with a piston rod must be filled with the ointment; the catheter is then inserted into the prostatic portion of the urethra, and the medication is forced out of the tube by means of the piston rod. The ointment preferred by Fingér is as follows:—

Nitrate of silver, tannin, or sulphate	
of copper,	gr. xv
Lanolin,	℥j
Olive oil,	℥ iss.

These applications may be repeated every second or third day. A very successful method of treating chronic gonorrhœa, when the lesions consist of foci of ulceration together with a good deal of catarrh, is by means of Unna's medicated sounds. An ointment is prepared as follows:—

Nitrate of silver,	gr. xv
Balsam of Peru,	℥ ss
Yellow wax,	℥ ss
Coca butter,	℥ iij.

This mass is liquefied by heat, the sound is dipped in it and is then hung up to dry. When these sounds are introduced the heat of the body melts the coating, and thus the whole urethra is medicated by the nitrate of silver.

The soluble medicated bougies also offer an excellent method of applying topical applications to the entire urethra. These are made in long and short sizes. One should be inserted at night and should be kept in place by a pledget of cotton pressed to the meatus and held there by a rubber adhesive strap.

The bougies containing sulphate of zinc, hydrastis canadensis, carbolate of zinc and carbolic acid, are most valuable. It must be borne in mind, however, that these applications medicate the entire urethra and are not indicated unless the local ulceration is accompanied by widespread catarrhal processes.

The chronic discharge depends, in the majority of cases, upon the presence of stricture which, in turn, is often accompanied by ulceration of the mucous membrane on the proximal side. These strictures may depend upon swelling and turgescence of the mucous membrane or may be due to a distinct deposit of inflammatory tissue, the process of cicatrization causing narrowing of the urethral canal.

What is stricture of the urethra ?

True organic stricture is a permanent narrowing of the urethral canal at one or more points, due to disease, injury, or congenital defect. There are also spasmodic or congestive strictures.

What are the causes of strictures ?

Gonorrhœa, traumatism, ulceration and masturbation.

What are the varieties of urethral stricture ?

In regard to cause we have an *idiopathic*, *traumatic* and *inflammatory*.

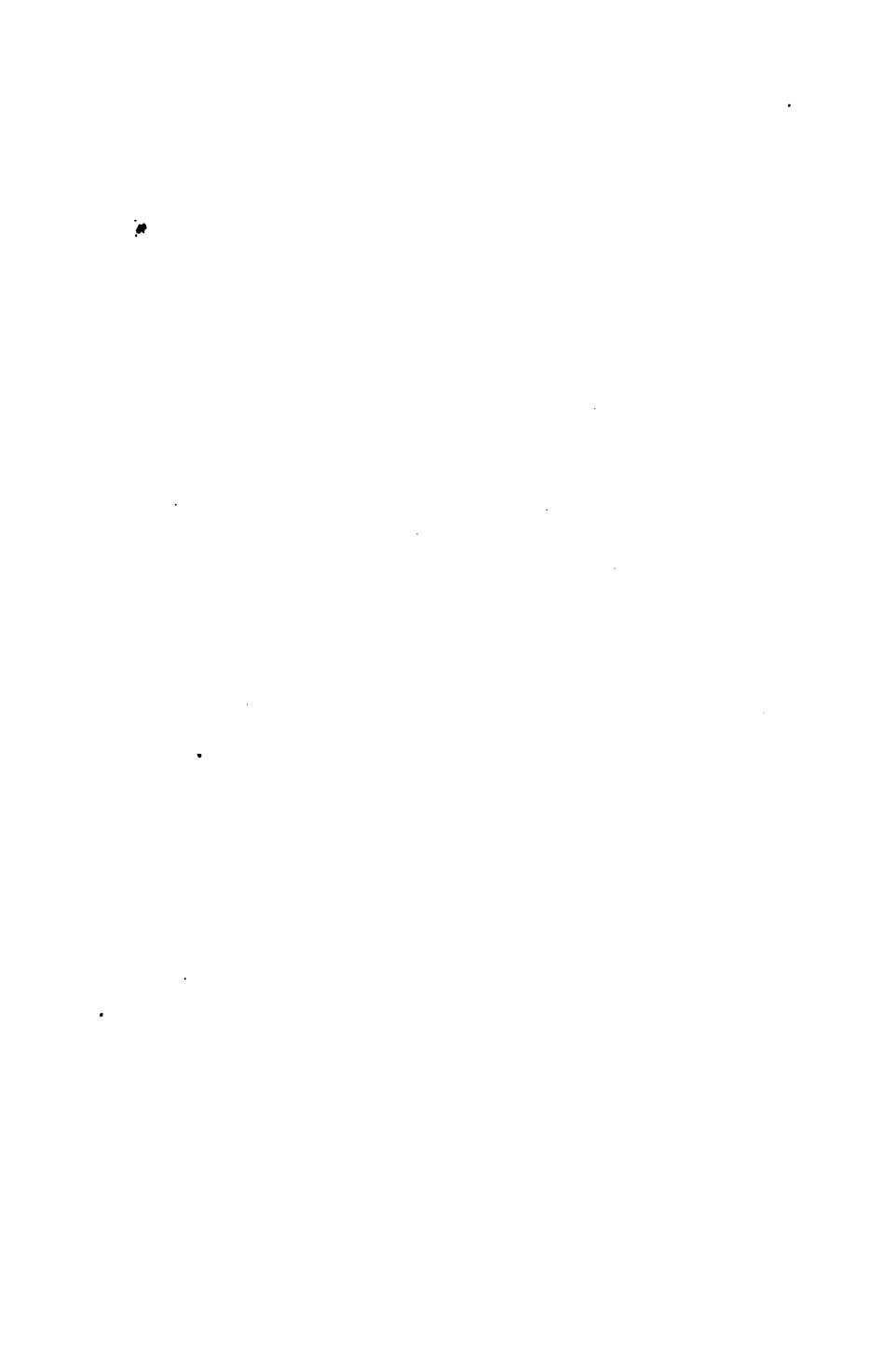
In regard to anatomical appearances *bridle stricture*. A band of lymph attached only by its ends, stretching across the urethra. *Annular*. A circular constriction as though a string were tied about the urethra. *Indurated Annular*. *Cartilaginous*.

In regard to the possibility of passing instruments strictures are classed as *permeable* and *impermeable*.

In regard to their behavior on manipulation, they may be *simple*, *irritable*, *contractile* or *recurring*.

What are the favorite seats of stricture ?

At the anterior part of the urethra, and just in front of the mem-



branous portion. Strictures are never found in the prostatic portion of the urethra.

What are the consequences of an untreated stricture?

Hyperæmia and inflammation about the stricture. Dilatation and thinning of the urethral walls behind. Hypersecretion and gleet. Ulceration may take place, followed by extravasation, abscesses, and fistulæ. From constant straining the bladder becomes thickened, hypertrophied and sacculated. The urine is retained and ferments; cystitis may reach a high grade. The inflammation passes along the ureters, involves the pelves of the kidneys, and may cause death by suppurative pyelitis or nephritis.

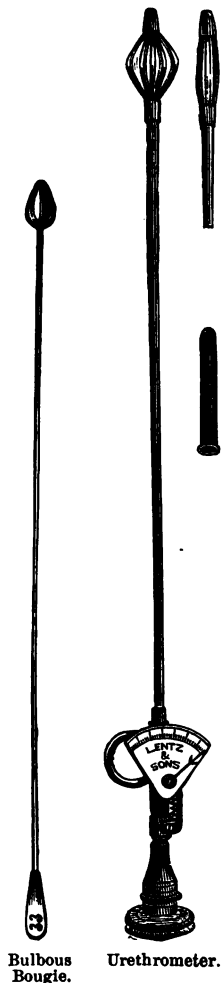
What are the symptoms of organic stricture of the urethra?

Gleety discharge, especially in the morning; increased frequency of urination, with some pain; twisting, forking, or diminution in the size of the stream. Retention may be the first and only sign. Later symptoms are due to involvement of other organs; hæmorrhoids frequently result from constant straining.

How do you diagnose strictures?

By examination of the urethra with bulbous bougies or the urethrometer. Commence with a medium-sized bulbous bougie and increase the size till decided resistance is experienced; or, if the first tried will not pass, diminish the size till one finally enters the bladder, marking on its stem the point where resistance begins; slowly

FIG. 75.





withdraw from the bladder, marking again the point where resistance begins ; this will give both the calibre and the width of the stricture. If the obstruction is more than seven inches from the meatus, it is probably due to an enlarged prostate. The possibility of spasm or the catching of the bulb of the bougie in a lacuna or at the triangular ligament must be borne in mind.

What special points must be observed in passing a bougie or catheter ?

See that the instrument is clean, smooth, and, if it is a catheter, pervious. Warm and oil, place the patient on his back with thighs flexed, bear in mind the course of the urethra, keep the catheter in the middle line, stretch the penis forward and upward, and use no force.

What difficulties may occur in passing the catheter ?

It may catch in a fold of mucous membrane, or in a lacuna. Avoid by keeping the point on the floor of the urethra at first, then along its roof. It may catch where the urethra enters the triangular ligament. Withdraw a little, and keep the point of the instrument along the roof of the urethra. It may make a new false passage, or enter one already made, denoted by a sudden slipping of the instrument, pain, and detection of the point of the catheter outside of the urethra by rectal examination. The handle of the bougie is deflected from the middle line, no urine escapes, the point is not freely movable, and, if the false passage is recent, there will be free bleeding.

How do you treat false passage ?

Withdraw the instrument at once, and make no further effort to pass it for one or two weeks. Infiltration of urine rarely takes place, the false passage healing promptly.

What constitutional effects may follow the passage of an instrument ?

Hæmaturia, due to reflex congestion, syncope, rigors, urethral fever, suppression of urine, pyæmia.

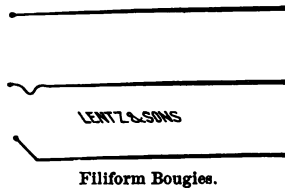
How may the dangers from these sequelæ be lessened ?

Render the urine antiseptic by the administration of salol, gr. x, t. i. d., for two days before treatment.



Pass the instrument with the patient in the recumbent position ; give twelve grains of quinine an hour before treating ; inject ten to twenty minims of a 1 per cent. solution of cocaine into the bulbous portion of the urethra, by means of the prostatic syringe, a few minutes before passing an instrument. Keep the patient in bed six to twenty-four hours after the instrument is used.

FIG. 76.



How are strictures treated ?

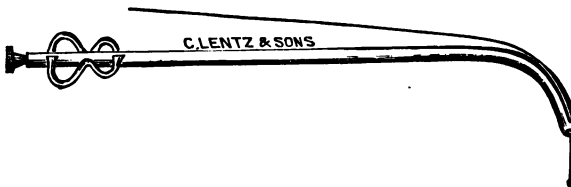
Strictures are treated by *dilatation*, *urethrotomy*, *excision* or *electrolysis*. Dilatation may be *intermittent*, *continuous* or *rapid*.

Urethrotomy or cutting may be either external or internal.

How do you get through a tight stricture ?

The patient may be previously relaxed, before attempting instru-

FIG. 77.



Filiform Threaded upon a Railroad Catheter.

mentation, by a warm bath and a hypodermic of morphia injected into the perineum. A small, soft, well-oiled catheter should first be inserted.

If this fails a small steel sound may be made to enter the bladder.

If still unsuccessful, a number of filiform bougies may be introduced into the urethra as far as they will go ; each bougie is then in

turn manipulated, an effort being made to guide it past the stricture. Patience and perseverance in this method nearly always result successfully. The railroad catheter may then be threaded upon the extremity of the filiform which has entered the bladder, and may be forced through the stricture without fear of making a false passage.

If it is not considered desirable to dilate the stricture immediately the filiform may be allowed to remain in place twenty-four hours, when sufficient softening of the stricture will have taken place to allow the passage of a small catheter.

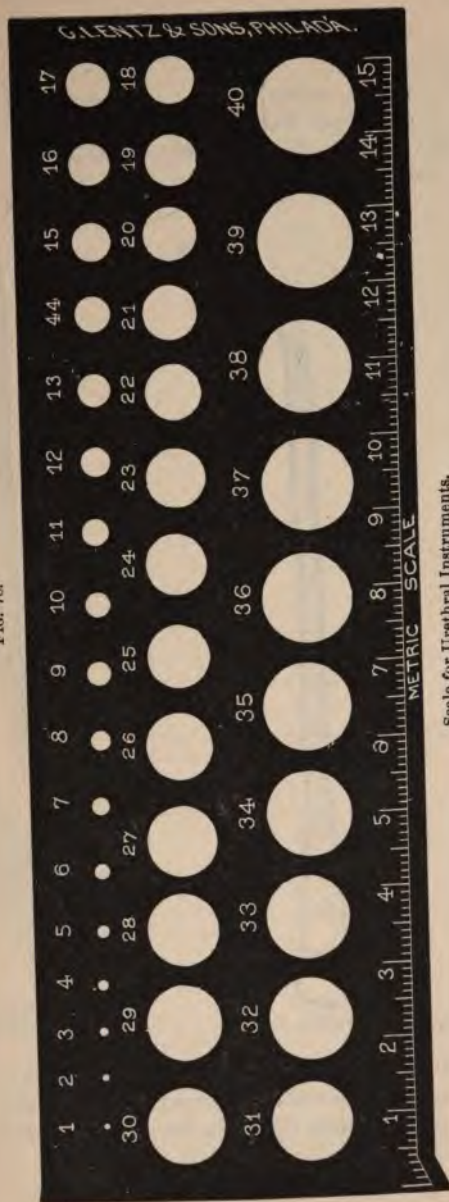
Describe intermittent dilatation.

In treating a stricture by dilatation it is necessary to restore the urethral canal to its normal calibre. Partial stretching of the stricture is of little avail, excepting that it relieves the most immediate and distressing symptoms. The calibre of the urethra varies in accordance with the size of the penis. If the circumference of the middle of the organ is three inches a French sound No. 30 will be required to accomplish full dilatation; $3\frac{1}{2}$ inches requires a 32; $3\frac{1}{2}$, 34; $3\frac{3}{4}$, 36; 4, 38, and over 4 No. 40.

The seat and calibre of the stricture are first determined by means of the urethrameter, or by bulbous bougies. The patient is instructed to urinate, and is placed on his back with the thighs flexed. The largest flexible bougie which can be passed through the narrowings is introduced and allowed to remain for two minutes. In three days the patient returns, and a larger instrument is introduced, the surgeon rarely running up more than four numbers at a single sitting. This treatment should be continued until the urethra readily receives a sound corresponding to its normal calibre, and the patient is then instructed to return once in two months for a year, lest the stricture should in the meantime contract. Thereafter the passage of a sound once in three or four months will usually be sufficient to prevent a recurrence of the pathological condition.

In passing sounds it is customary to run up two numbers at a time, thus, if No. 16 is readily received, No. 18 is next introduced, and next No. 20. Soft rubber bougies are, in general, safer instruments than steel sounds. The latter, however, can be very thoroughly cleaned, and are more directly under the control of the surgeon. In some cases, where there is marked spasm, it is

FIG. 78.



Scale for Urethral Instruments.

impossible to pass a rubber bougie. In passing sounds the first precaution to observe is that the instruments shall be thoroughly cleaned. This is accomplished by dipping them in alcohol and

FIG. 79.



Soft Rubber Bougie.

FIG. 80.



Steel Sound.

FIG. 81.



Meatus Bougie.

igniting the latter, this superficial flaming not destroying the temper of the instrument, and nevertheless rendering the surfaces perfectly sterile. The sound is then dipped in five per cent. carbolic oil, and



is passed gently into the urethra. The surgeon stands to the right of the patient, holds the penis in his left hand, and places the blunt extremity of the sound in the meatus. As soon as it has entered to the depth of two inches the handle of the instrument is carried toward the linea alba until it lies parallel with that line and with the plane of the hypogastric portion of the belly. The sound is then gently pressed into the urethra to the depth of 6 to 7 inches, when its extremity will have reached the membranous part, and will enter no further. The handle is now elevated until it stands at right angles to the plane of the hypogastrium. As this movement is effected the instrument enters the membranous portion of the urethra; it is passed on into the bladder by depressing the handle between the legs.

Describe continuous dilatation.

The patient is put to bed, a flexible catheter is passed through the stricture into the bladder, and is allowed to remain one or two days. It is then replaced by a large instrument. This method is continued until the stricture is dilated up to the normal calibre of the urethra.

Under what circumstances may continuous dilatation be employed?

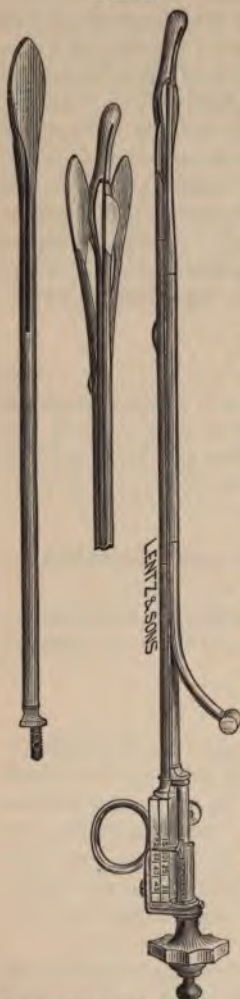
Where there is very great difficulty in introducing an instrument; where the stricture is irritable or contractile, and there are objections to the performance of internal urethrotomy.

Describe internal urethrotomy.

The instruments required are, in the first place, the urethrometer, to determine the exact seat and extent of the strictures, and a knife by which the latter may be divided without injury to other portions of the mucous membranes of the urethra. These indications are met by the Gerster dilating urethrotome, which keeps the part upon the stretch while it is being cut, and which enables the surgeon to determine when the normal calibre of the urethra has been reached.

The patient should be prepared as for any surgical operation, by attention to the condition of the stomach and bowels for a few days. In addition ten grains of salol should be given three times daily for

FIG. 82.



Gerster Dilating Urethrotome.

two days. When from nervous temperament, chronic inflammation of the urethra, or diseased kidneys, there is reason to fear urethral fever, twelve grains of quinia may be given four hours before the operation. The urine should be examined. A most careful diagnosis of the seat and extent of the strictures should be made. The meatus must be either dilated, or divided along its floor until it admits an instrument of the normal calibre of the urethra. The stricture should be completely divided along the roof of the urethra, exactly in the middle line. The free bleeding which occurs usually stops spontaneously in a few minutes. If it continues a bandage may be applied to the penis, or if this fails, a soft catheter may be passed till its extremity lies just beyond the seat of operation, and the bandage may then be applied. When the bleeding is from the deep urethra, firm pressure against the perineum is indicated. For several nights after operation the patient should be watched, as dangerous bleeding may take place from erection occurring in sleep. On the second day after operation, a full-sized sound is very gently passed to just beyond the seat of operation. This is repeated every third day till the parts are entirely healed.

What are the indications for internal urethrotomy?

Internal urethrotomy is applicable to all chronic strictures in the pendulous portion of the urethra. This operation is especially indicated when the stricture is

densely indurated and cartilaginous, and when it does not yield to gradual dilatation, or quickly relapses when treatment is suspended, also when it is impossible for the patient to devote the time necessary for the cure of stricture by gradual dilatation, and when, every time a bougie is passed, there is a marked tendency to the occurrence of urethral fever.

What is the ultimate prognosis in internal urethrotomy?

Internal urethrotomy, if properly performed, usually results in a complete and permanent cure of the stricture. Periurethral abscesses, chordee and other complications are rare.

What strictures call for external urethrotomy?

Dense cartilaginous strictures in the membranous portion of the urethra, or irritable and contractile strictures in the same region, especially when complicated by perineal fistulæ.

Syphilis.

What is syphilis?

Syphilis is a constitutional disease due to inoculation with specific virus.

What is the primary lesion of syphilis?

The chancre.

What is the period of primary incubation?

The time which elapses between exposure to contagion and the appearance of a chancre. It is usually from two to three weeks, rarely more than five weeks.

What is the period of secondary incubation?

The time between the appearance of chancre and the development of secondary symptoms. These rarely appear before the first or after the third month succeeding the chancre.

When do tertiary symptoms appear?

At a period varying from a few months to many years after the secondaries.

Describe the chancre or primary sore.

The Chancre is commonly found about the corona glandis, but it

may appear on any portion of the body. It is contracted *directly* by contact with chancre, or secondaries (mucous patches); *indirectly*, from articles used by syphilitics. It appears as an indurated papule, which develops into an abrasion, tubercle, or ulcer.

What are the characteristics of the primary sore?

Indurated base.

Thin, scanty secretions.

Inflammation slight around the sore.

Usually single.

Not auto-inoculable.

Accompanied by polyganglionic, painless buboes, which rarely sup-purate.

Appears after an incubation period, and is followed by secondary eruptions.

The Hunterian chancre is characterized by greater depth, free discharge, and more marked induration.

The mixed chancre exhibits the peculiarities of both syphilitic and chancroidal inflammation, and is due to simultaneous inoculation with both forms of virus.

What is the prognosis of chancre?

A sore exhibiting the typical characteristics of chancre is nearly always, but not invariably, followed by secondary eruptions. The chancre rarely produces extensive destruction of tissues and usually undergoes spontaneous cure.

What is the treatment of chancre?

The sore should be washed several times daily with black-wash, and dusted with calomel, subiodide of bismuth, iodol, or iodoform. Mercury treatment should not be begun until the secondaries appear.

What symptoms denote that the disease will assume a severe type?

Extensive and persistent induration of the chancre.

General and marked enlargement of the lymphatic glands. Appearance of the secondary eruption before the seventh week.

Describe the secondary lesions.

General enlargement of the lymphatic glands.

Eruptions of the skin and mucous membranes ; at times inflammation of the iris or periosteum, and falling of the hair.

Pathologically, these eruptions are at first due to congestion, which is followed by small, round-celled infiltration. This in turn may result in ulceration.

The development of secondaries is preceded by general malaise, fever, and ænemia, lasting a few days and disappearing on the appearance of roseola and sore throat.

The skin eruption may simulate the various forms of skin disease. It may be erythematous (s. roseola), papular (s. lichen), vesicular (s. herpes, eczema, and varicella), bullous (s. pemphigus), or pustular (s. ecthyma, acne, or variola).

The mucous membrane lesions are pathologically identical with those of the skin. There is first congestion and infiltration (syphilitic sore throat), this is followed by maceration of the epithelium (mucous patches), finally ulcers result.

What are the characteristics of syphilitic skin eruptions ?

Absence of itching.

Symmetrical arrangement (on the two sides of the body).

Reddish-brown or coppery color (raw ham).

Polymorphous (many kinds of eruption at the same time).

Therapeutic test (use of mercury).

Describe the mucous patch.

Synonyms.—Condyloma ; mucous tubercle.

Pathology.—A congested, infiltrated macule, the surface of which is, from its peculiar position (upon mucous membrane, about the anus, on the scrotum, in the gluteal folds), continually moist, in consequence of which the epithelium becomes sodden.

Appearance.—A somewhat elevated, flat macule, covered with a dirty whitish, offensive exudation.

Give the treatment of secondary syphilis.

Mild forms of the disease are said to have a natural tendency toward spontaneous resolution. Where the patient is of a vigorous constitution and is willing to submit to persistent surface eruptions the treatment may be purely expectant, every attention being paid to general hygiene, and no specific medication being administered for

the eradication of the disease. When practicable, nine or twelve months camping out may enable the patient to thoroughly eradicate the syphilitic taint.

If the disease is severe in type, or attacks persons not previously in the enjoyment of good health, vigorous medication will be required. The only drugs which seem to act powerfully upon the syphilitic lesions are iodine, iodide of potassium and mercury. Of these mercury seems to be most efficacious during the secondary period of the disease. It may be given in various forms and by various methods.

The protiodide of mercury is the form in which the drug is usually administered; of this a quarter of a grain is given three times a day as soon as the early secondaries (enlargement of the lymphatic glands, mucous patches, etc.) make it positive that the patient is infected with syphilis.

Every other day this quantity is increased by one quarter of a grain, the drug being administered in pill form; the quantity given is steadily increased until the constitutional effects of mercury are produced. When protiodide is administered the first effects of the drug are frequently manifested by two or three painful, watery, alvine evacuations. If the drug is still continued the offensive breath and beginning mouth tenderness of *ptyalism* will next be noticed. The daily quantity must then be cut down one half, and continued for eighteen months unless new symptoms appear, when the dose may be temporarily increased.

After eighteen months iodide of potassium, from five to ten grains three times a day, is given in addition to the regular quantity of mercury. This mixed treatment is continued for six months or a year. The patient may then be allowed to discontinue treatment. In the meantime he is kept carefully under observation for the detection of any new manifestation of the disease. If such manifestations appear the mixed treatment must be resumed and continued from four to twelve months. During the latter part of this prolonged treatment the mercury may be suspended and the iodide of potassium alone administered.

In case the protiodide pills produce disorder of the stomach or bowels before they can be taken in sufficient quantity to modify the manifestations of the disease, a small quantity of watery extract of opium may be administered.

At times it will be found that protiodide causes much irritation, even when opium is added, and that it is impossible to give it in sufficient dose. In this case the form of mercury can advantageously be changed. The following formula is a very excellent one.

R. Mass. hydrarg., gr. ij
 Ferr. sulph. exsicc., gr. j. M.

Ft. pill No 1.

SIG.—1 t. i. d. Increase as required.

When iodide of potassium is added to the mercury it is convenient to administer these two drugs together. The following prescription may then be employed :—

R. Hydrarg. chlor. corros., gr. iss-ijj
 Potass. ioidid., ʒ iv-vij
 Syrup. zingib., fʒ iij
 Aquæ, q. s. fʒ vj. M.

SIG.—Teaspoonful in water three times a day.

If the iodide is administered alone it should be ordered in the form of the saturated solution.

R. Potassium iodide, ʒj
 Distilled water, q. s., . . ad . . ʒj. M.

Each minim contains 1 grain; the required number of minims should be taken in milk, which disguises the taste of the iodide

During the course of the mercury treatment it is most important to maintain the general health of the patient. Tonics, such as quinine, iron and cod-liver oil should be administered, unless they have a tendency to disorder the stomach. The life of the patient should be most carefully regulated in accordance with hygienic rules. Stimulants, if used at all, must be taken in extreme moderation and with food.

At times no form of mercury can be taken by the mouth; it may then be administered by *inunction*, by *vaporization*, or by *hypodermic medication*.

When given by *inunction*, the patient is instructed to take a warm bath in the evening on retiring. One drachm of mercury ointment is then rubbed for fifteen minutes into the inner surface of the arm and forearm, and the corresponding side of the chest. A silk

or flannel undershirt is next donned, and the patient puts on his ordinary night garments. This undershirt must be worn for one week. The next night the rubbing is repeated as before, but upon the opposite side of the body. The following night the ointment is rubbed into the left groin and the inner surface of the left leg and thigh; next into the right groin, leg and thigh, and the fifth night into the surface of the belly and anterior portion of the chest. On the sixth night a warm bath is taken, after which the ointment is rubbed in as upon the first night.

In place of blue ointment the oleate of mercury may be employed, although this is more irritating to the skin than the mercury ointment. A very convenient method of practising inunctions, though not so prompt in effect as the one described above, is that advocated by Sturgis.

Before starting the inunction the patient is directed to take a hot foot-bath; into the sole of the right foot is then rubbed a half drachm of a twenty per cent. solution of oleate of mercury, and the next night a similar quantity is rubbed into the left foot; thus alternating, the mercury is rubbed in every night. The same stockings must be worn continuously for one week, after which the feet are thoroughly cleansed and the treatment is intermitted for two or three days. The quantity of mercury thus rubbed in may be increased to suit the requirements of the case.

When it is not practicable to give mercury, either by the mouth or in the form of inunction, it may be administered in the form of *vaporization*. To accomplish this the patient is seated, naked, upon a chair and surrounded with blankets, the head only being left out. Beneath the tent thus formed is placed a large vessel filled with boiling water. After the skin is thoroughly softened by means of this steam bath, from half a drachm to a drachm of calomel is placed upon a metal dish and is vaporized by the heat of an alcohol lamp, the whole being placed beneath the chair, and the vapor being prevented from escaping by keeping the blankets applied closely about the patient's neck. In fifteen minutes the patient is wrapped in the blankets which have formed the vapor tent and is put to bed. These blankets may be removed in from half an hour to an hour.

When other means of introducing mercury are not available, or when it is particularly important that an immediate effect should be



produced, the drug may be administered hypodermically. Both the soluble and insoluble preparations of mercury are employed, but on account of the pain and local inflammation produced by the latter the former are greatly to be preferred. The hypodermic solution may be prepared according to the following formula :—

R. Bichloride of mercury, gr. iij
 Chloride of sodium, 3 ss
 Distilled water, 3 x.

SIG.—Ten to twenty minims of this may be injected daily.

In regard to the choice of method by which mercury can be introduced into the system, there is little doubt but that inunctions act most powerfully upon the manifestations of the disease, and at the same time are less likely to exert the deleterious influences of the drug upon the system.

Where a quick action is imperative, the hypodermic medications should be employed. Where the convenience of the patient is consulted, however, and this usually governs the method of administering the mercury, it may be given by the mouth.

Although long-continued treatment is ordinarily advised, many authorities administer drugs only till the symptoms of the disease disappear, and then discontinue the treatment until further manifestations justify its resumption. Under no circumstances should a patient be salivated. This condition distinctly and seriously complicates the natural course of a case of syphilis. The so-called tonic doses of mercury, that is, half the quantity necessary to produce the first symptoms of ptyalism, seem to exert a decidedly beneficial effect upon the blood aside from the specific action upon the syphilitic manifestations.

In addition to the general treatment of syphilis, local lesions may be materially modified by topical applications.

The rapid disappearance of the *secondary eruptions appearing upon the hands and face* may be accomplished by the use of heat. The infected portion of the skin may be covered with a layer of lint wrung out in hot water; to this is applied a hot-water bag. This treatment is continued for half an hour, and is repeated three times a day.

During the night the patient may wear a face mask smeared with

oleate of mercury three to five per cent. or with five to ten per cent. ointment of ammoniated mercury. Gloves may be worn, the inner surfaces of which are coated with the same preparations.

Mucous patches, if found on the skin, should be washed with mild solutions of bichloride of mercury, dusted with calomel, and kept dry by introducing a layer of absorbent cotton between the skin surfaces. Mucous patches in the mouth are treated by astringent gargles such as myrrh, hydrastis and chlorate of potash. Each patch should be touched with the solid stick of nitrate of silver, or, by means of a glass rod, with the acid nitrate of mercury. The pain of this last application may be prevented by the previous application of cocaine.

Should the patient become salivated, he should be instructed to rinse out the mouth many times each hour with a warm solution of chlorate of potash, fifteen grains to the ounce. Of this one teaspoonful should be swallowed daily. To this chlorate of potash mouth-wash may be added belladonna, one-half a drachm to the ounce, and tincture of myrrh. No effort should be made to check the diarrhoea, since this is one of the ways in which the drug is eliminated. Local application of cocaine to the gums will greatly relieve the sufferings of the patient.

Ulcerating syphilides are cleansed and dressed according to general surgical principles.

When iodide is indicated and the patient cannot tolerate it, iodine may be employed in its place. The following formula may be ordered :—

R. Tincture of iodine, ℥ ij
Simple syrup, ℥ ij.

SIG.—A teaspoonful, diluted with water, three times a day with meals, to be increased as required.

Describe the tertiary lesions of syphilis.

Between the secondaries and tertiaries proper there are certain symptoms which sometimes appear, called reminders. Among these are skin eruptions, enlargement of the testicle, choroiditis, ulceration of the tongue, disease of the arteries, and psoriasis of the palms.

The *tertiary lesion* of syphilis is the *gumma*. This has no tendency to spontaneous cure, and is characterized by the formation of

round-celled infiltrations, which commonly involve the surrounding tissues, and either break down in the centre, leaving ulceration, or are absorbed, leaving a fibroid thickening and scarring (syphilitic stricture of œsophagus, etc.). The *gumma* may attack the periosteum, causing nodes, caries or necrosis; the cutaneous or mucous surfaces, causing ulcers on any part of the body. These ulcers of tertiary syphilis are symmetrical, and are not contagious.

Give the treatment of tertiary syphilis.

Mercury and potassium iodide, or iodide of potassium alone or combined with tonics. Commence with ten grains of potassium iodide three times a day, gradually increasing the dose till the desired effect is accomplished. During the course of the iodide treatment the disappearance of symptoms may be greatly hastened by mercury inunctions, twelve of these being given at a time, with intervals of one or two weeks between each course.

What are the characteristics of the tertiary ulcer?

A tertiary ulcer begins as a *gumma* or lump, which, when it breaks, exposes a gray slough, surrounded by granulation tissue. The edges are rounded and sharply cut. Other signs of syphilis can be found. The affection yields to specific treatment. The *gumma* frequently affects the leg, causing an ulcer; such ulcers are commonly found upon the upper third of the limb.

What is meant by syphilitic cachexia?

When syphilis affects persons before feeble, or weakened by struma or debilitating diseases, it frequently assumes a malignant form. Treatment seems only to aggravate the symptoms, at the same time producing profound anæmia. The viscera undergo serious pathological alterations, absorption practically ceases, and the disease terminates fatally. In these cases specific constitutional treatment is worse than useless. Tonics, stimulants, and general hygienic treatment represent all that can be done for the patient.

What is congenital syphilis?

Syphilis transmitted to the fœtus through the spermatozoa of the father, or the ovum of the mother.

What are the characteristics of congenital syphilis?

Manifestations are rare before four to six weeks after birth; then

there may be secondaries, as snuffles or coryza, macular or papular eruptions, mucous patches, ulcerations about the mouth and lips (rhagades), stomatitis, which, by its effect upon the dental sacs of the permanent teeth, causes subsequent development of Hutchinson's teeth. After some years tertiaries develop. These commonly take the form of interstitial keratitis, and gummatous developments.

Describe Hutchinson's teeth.

The upper permanent median incisors chiefly show this lesion, which consists in a dwarfing of the entire tooth, an extreme diminution in its free end, and a narrowing of the cutting edge, with a central notch or crescent.

Give the treatment of hereditary syphilis.

This is conducted upon the same lines as is the treatment of acquired secondaries. Mercury is best given by inunction, gr. x of unguent. hydrarg. being rubbed over the abdomen and covered by the belly-band every night. When the symptoms disappear mercury treatment should be discontinued. A non-infected woman should not be allowed to suckle a syphilitic child. The tertiaries are treated by mercury, together with iodide of potassium and tonics.

What is Colles's law?

A syphilitic child suckled by its mother will not infect her, though she be (apparently) free from venereal disease.

This is because she is already infected with the disease, which attacks her in a latent form.

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ANTISEPTIC FORMULÆ.**Watery solutions.**

Bichloride of mercury, 1-1000-1-2000.

For making solutions, which are to be kept for some length of time, sodium chloride should be added in quantity equal to that of the bichloride.

A convenient solution for preparing lotions of the strength ordinarily used is the following :—

R.	Bichloride of mercury,	2	
	Sodium chloride,	1	
	Dilute acetic acid,	1	
	Water,	16.	M.

This makes a ten per cent. bichloride solution ; by adding water in appropriate quantity 1-1000 and 1-2000 solutions are readily made.

The watery solutions of other antiseptic solutions are commonly used in the following strengths :—

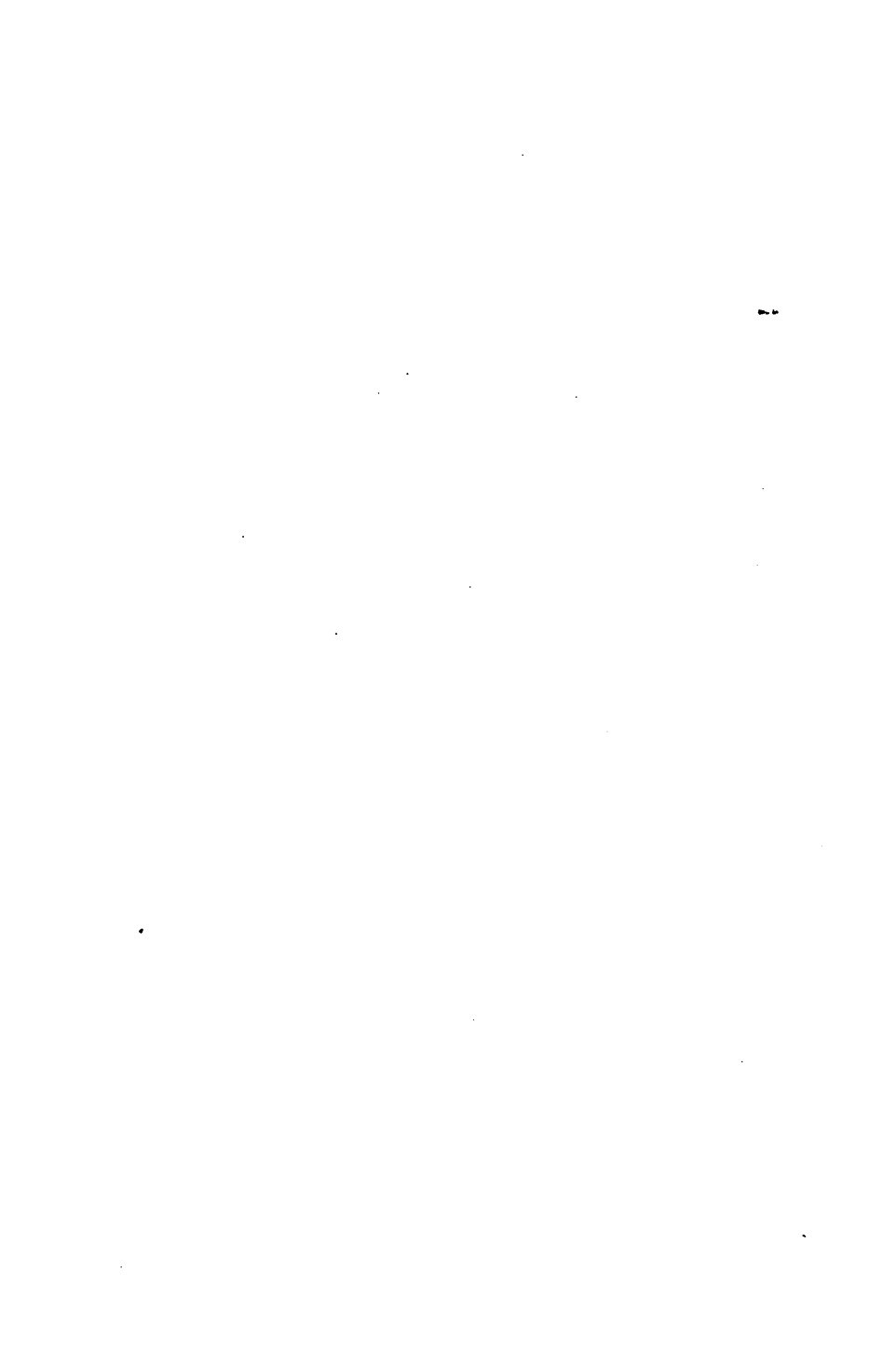
Carbolic acid,	1-20 or 1-40
Salicylic acid,	1-300
Boric acid,	1-30
Chloride of zinc,	1-10 or 1-20
Permanganate,	1-1000
Carbolized oil,	1-10
Iodoform collodion,	1-10
Creolin,	1-20 or 1-40.

Ointments.**Iodoform.**

R.	Iodoform,	5	
	Vaseline,	30	
	Oil of almonds,	10	M.

Boric acid.

R. Boric acid,	3	
Paraffine,	10	
Vaseline,	5	M.



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